AIRPLANE

MAINTENANCE MANUAL

CARD 1 OF 4

PA-28-181
ARCHER II
ARCHER III

PIPER AIRCRAFT CORPORATION

(PART NUMBER 761 679 **July 30, 1994**

1A1

Island Enterprises

Published by
Technical Publications

Piper Aircraft Corporation
2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member of GAMA
General Aviation
Manufacturers Association

1A2

Island Enterprises

INTRODUCTION

AEROFICHE EXPLANATION AND REVISION STATUS

The Maintenance Manual information incorporated in this set of Aerofiche cards has been arranged in accordance with the general specifications of Aerofiche adopted by the General Aircraft Manufacturer's Association (GAMA).

Conversion of Aerofiche alpha/numeric code numbers:
First number is the Aerofiche card number.
Letter is the horizontal line reference per card.
Second number is the vertical line reference per card.
Example: 2J16 = Aerofiche ,card number two of given set, Grid location J16.

The following is provided to aid in locating the various chapters and related service information desired.

1. A complete manual System/Chapter Index Guide is given at Grids A8 thru A9 of all fiche in this set.
2. A complete list of Illustrations is given at Grids A10 thru A14 of all fiche in this set.
3. A complete list of Charts is given at Grids A15 and A16 of all fiche in this set:
4. A complete list of paragraph titles and appropriate Grid location numbers is given at the beginning of each Chapter relating to the information within that Chapter.
5. Identification of Revised Material.

   Revised text and illustrations are indicated by a black vertical line along the left hand margin of the frame, opposite revised, added or deleted material. Revision lines indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation, indexing, the physical location of material or complete page additions are not identified by revision lines.
6. Revisions to this Maintenance Manual 761 679, issued August 16, 1978, are as follows:

Revisions	Date	Aerofiche Card Effectivity
ORG780816	August 16,1978	—
CR870801	September 16, 1987	1, 2 and 3
CR940731	July 31. 1994	1, 2, 3 and 4

The date on Aerofiche cards should not be earlier than the date noted for the respective card effectivity. Consult the latest Aerofiche card in this series for current Aerofiche card effectivity.

VENDOR PUBLICATIONS.

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

ENGINE:

Overhaul Manual = AVCO LYCOMING - OVERHAUL MANUAL
DIRECT DRIVE ENGINE - P/N 60294-7
Avco Lycoming Division
Williamsport, PA 17701

Parts Catalog = AVCO LYCOMING - P/N PC-102
Avco Lycoming Division
Williamsport, PA 17701

Operators Handbook = AVCO LYCOMING O-360
SERIES AIRCRAFT ENGINES - P/N 60297-9
Avco Lycoming Division
Williamsport, PA 17701

PROPELLER:

Repair Manual = METAL PROPELLER REPAIR MANUAL
Sensenich Corporation
P.O. Box 1168, Lancaster, PA 17604

MAGNETOS:

Service Manual = SLICK-AIRCRAFT MAGNETOS
Catalog and Service Manual
SLICK ELECTRO Inc
Rockford, IL 61101

WHEEL AND STRUT FAIRINGS:

Repair Manual = A.B.S. THERMOPLASTIC LANDING GEAR
WHEEL AND STRUT FAIRING REPAIR
INSTRUCTION MANUAL - P/N 761 708
Vero Beach Service Sales Department
Piper Aircraft Corporation
Vero Beach, Florida 32960

DRY AIR PUMPS:

Service Information = AIRBORNE DIVISION
AIR AND FUEL PRODUCTS
Parker Hannifin Corporation
711 Taylor St.
Elyria, OH 44036

AUTO FLIGHT:

SEE CHAPTER 22 AUTO FLIGHT

SERIAL NUMBER INFORMATION

PA-28-181, ARCHER II - 1976
Serial Numbers 28-7690001 to 28-7690479 inclusive
PA-28-181, ARCHER II - 1977
Serial Numbers 28-7790001 to 28-7790607 inclusive
PA-28-181, ARCHER II -1978
Serial Numbers 28-7890001 to 28-7890564 inclusive
PA-28-181, ARCHER II - 1979
Serial Numbers 28-7990001 to 28-7990626 inclusive
PA-28-181, ARCHER II - 1980
Serial Numbers 28-8090001 to 28-8090382 inclusive
PA-28-181, ARCHER II - 1981
Serial Numbers 28-8190001 to 28-8190336 inclusive
PA-28-181, ARCHER II - 1982
Serial Numbers 28-8290001 to 28-8290188 inclusive
PA-28-181, ARCHER II - 1983
Serial Numbers 28-8390001 to 28-8390090 inclusive
PA-28-181, ARCHER II - 1984
Serial Numbers 28-8490001 to 28-8490112 inclusive
PA-28-181, ARCHER II - 1985
Serial Numbers 28-8590001 to 28-8590092 inclusive
PA-28-181, ARCHER II - 1986
Serial Numbers 28-8690001 to 28-8690056 inclusive
Serial Numbers 2890001 to 2890205*
PA-28-181, ARCHER III
Serial Numbers 2890206 and up

*New method of assigning serial numbers used.

GAMA SYSTEM/CHAPTER INDEX GUIDE

SYST CHAP	SUB-SYST SECTION TITLE	AEROFICHE GRID NO.
4	AIRWORTHINESS	1A17
5	TIME LIMITS/MAINT CHECKS	1A21
6	DIMENSIONS AND AREAS	1B15
7	LIFTING AND SHORING	1C4
8	LEVELING AND WEIGHING	1C9
9	TOWING AND TAXIING	1C14
10	PARKING AND MOORING	1C18
11	PLACARDS AND MARKINGS	1C22
12	SERVICING	1D9
20	STANDARD PRACT - AIRFRAME	1E19
21	ENVIRONMENTAL SYSTEM	1F18
22	AUTOFLIGHT	1I6
23	COMMUNICATIONS	1I11
24	ELECTRICAL POWER	1J3
25	EQUIPMENT/FURNISHINGS	2A17
27	FLIGHT CONTROLS	2A24
28	FUEL	2D10
32	LANDING GEAR	2E16
33	LIGHTS	2G8
34	NAVIGATION & PITOT/STATIC	2H14

GAMA SYSTEM/CHAPTER INDEX GUIDE (CONTD)

SYST CHAP	SUB-SYST SECTIONTITLE	AEROFICHE GRID NO.
37	VACUUM SYSTEM	2I13
39	ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS	2J9
51	STRUCTURES	2J19
52	DOORS	2K18
55	STABILIZERS	2L7
56	WINDOWS	3A17
57	WINGS	3B3
61	PROPELLER	3B24
70	STANDARD PRACTICES - ENGINE	3C10
71	POWER PLANT	3C15
73	ENGINE FUEL SYSTEM	3D24
74	IGNITION	3E16
77	ENGINE INDICATING	3G7
78	EXHAUST	3G16
79	OIL SYSTEM	3G23
80	STARTING	3H10
91	CHARTS AND WIRING DIAGRAMS	3I4
91	CHARTS AND WIRING DIAGRAMS (CONT.)	4A17

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
6-1.	Three View - Archer II	1B20
6-2.	Three View - Archer III	1B21
6-3.	Station References - Archer II	1B22
6-4.	Station References - Archer III	1B24
6-5.	Access Plates and Panels	1B20
7-1.	Jacking Arrangement	1C7
8-1.	Leveling Longitudinally	1C11
8-2.	Leveling Laterally	1C11
8-3.	Weighing Airplane	1C12
11-1.	External Placards and Decals - Archer II	1C24
11-2	External Placards and Decals - Archer III	1D1
11-3	Internal Placards and Decals - Archer II	1D3
11-4	Internal Placards and Decals - Archer III	1D5
12-1.	Fuel Filter Bowl and Screen	1D14
12-2.	Servicing Points	1D19
12-3.	Main Gear Oleo Struts (cut-away view)	1D22
12-4.	Tire Balancer Fixture	1D24
12-5.	Lubrication Chart (Landing Gear, Main)	1E8
12-6.	Lubrication Chart (Landing Gear, Nose)	1E9
12-7.	Lubrication Chart (Control System)	1E10 thru 1E13
12-8.	Lubrication Chart (Cabin Door, Baggage Door and Seat)	1E14
12-9.	Lubrication Chart (Power Plant and Control Pivot Points)	1E15
12-10.	Lubrication Chart (Air Conditioning Condenser)	1E16
20-1.	Torque Wrench Formula	1E22
20-2.	Installing Rod End Bearings	1E23
20-3.	Cherrylock Rivet Removal	1E24
20-4.	Hose and Line Markings	1F1
20-5.	Flareless Tube Fittings	1F2
21-1.	Cabin Heater, Defroster, and Fresh Air System (Archer II)	1F23
21-2.	Overhead Vent System (not available with air conditioning) (Archer II)	1F24
21-3.	Cabin Heater, Defroster, and Fresh Air System (Archer III)	1G1
21-4.	Overhead Vent System (Archer III)	1G2
21-5.	Air Conditioning System Installation (Typical)	1G11
21-6.	Service Valves - Archer II (Sheet 1 of 2)	1G17
21-6.	Service Valves - Archer III (Sheet 2 of 2)	1G17
21-7.	Test Manifold and Charging Cart	1G18
21-8.	Manifold Set Operation	1G18
21-9.	Manifold to Recharging/Test Stand Hookup	1G19
21-10	Robinair 34700 Control Panel and Hose Connections	1G20
21-11	Robinair 34700 Hose Hookup	1G21
21-12	Compressor and Fabricated Oil Dipstick	1H6

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
21-13.	Compressor and Alternator Belt Installation (Sheet 1 of 2)	1H8
21-13.	Compressor and Alternator Belt Installation (Sheet 2 of 2)	1H9
21-14.	Magnetic Clutch	1H11
21-15.	Condenser Air Scoop Installation	1H14
21-16.	Expansion Valve	1H15
21-17.	Components Installation	1H17
21-18.	Air Conditioning Wiring Schematic (typical) - Archer II Sheet 1 of 2	1H19
21-18.	Air Conditioning Wiring Schematic (typical) - Archer III Sheet 2 of 2	1H20
23-1.	Two Year, Magnesium Battery Connections	1I15
23-2.	Communications Components Corporation ELT Schematic	1I16
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 1 of 2) (S/N's 28-7990457 thru 28-8690056 and 2890001 thru 2890065)	1I17
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 2 of 2) (S/N's 2890066 thru 2890139)	1I17
23-4.	ELT Portable Folding Antenna (Narco)	1I18
23-5.	ELT Using Fixed Aircraft Antenna (Narco)	1I18
23-6.	Narco ELT 910 Emergency Locator Transmitter Schematic	1I20
23-7.	ELT 910 Battery Pack	1I21
23-8	Artex 110 E. L. T.	1I22
23-9	Artex E. L. T. 110 Wiring Schematic	1I23
24-1.	Exploded View of Prestolite Alternator	1J16
24-2.	Lamp-Bank Load	1J16
24-3.	Removal of Slip Ring End Bearing (Prestolite Alternator)	1J20
24-4.	Removal of Rectifier (Prestolite Alternator)	1J20
24-5.	Removal of Drive End Head (Prestolite Alternator)	1J20
24-6.	Removal of End Head Bearing (Prestolite Alternator)	1J20
24-7.	Testing Rotor for Ground (Prestolite Alternator)	1J22
24-8.	Testing Rotor for Shorts (Prestolite Alternator)	1J22
24-9.	Installation of Bearing (Prestolite Alternator)	1J22
24-10.	Installation of Rectifier (Prestolite Alternator)	1J22
24-11.	Terminal Assembly (Prestolite Alternator)	1J24
24-12.	Slip Ring End Bearing Assembly (Prestolite Alternator)	1J24
24-13.	Testing Prestolite Alternator	1J24
24-14.	Prestolite Brush Installation	1J24
24-15.	Prestolite Alternator Internal Wiring Diagram	1K2
24-16.	Exploded View of Chrysler Alternator	1K3

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-17.	Checking Chrysler Alternator Field Coil Current Draw	1K5
24-18.	Testing Chrysler Alternator Field Circuit	1K6
24-19.	Chrysler Alternator Rectifier End Shield and Stator Assembly	1K7
24-20.	Testing Chrysler Alternator Positive Rectifiers with C3829 Tester	1K8
24-21.	Testing Chrysler Alternator Negative Rectifiers with C-3829 Tester	1K8
24-22.	Testing Chrysler Alternator Positive Rectifiers with Test Lamp	1K9
24-23.	Testing Chrysler Alternator Negative Rectifiers with Test Lamp	1K9
24-24.	Chrysler Alternator Rectifier and Heatsink Assembly Removal	1K10
24-25.	Chrysler Alternator Rectifier End Shield Assembly	1K10
24-26.	Testing Chrysler Alternator Stator	1K11
24-27.	Removal of Chrysler Alternator Pulley	1K11
24-28.	Removal of Chrysler Alternator Bearing	1K11
24-29.	Removal of Chrysler Alternator Rectifier End Shield Bearing	1K11
24-30.	Testing Chrysler Alternator Rotor for Ground	1K12
24-31.	Testing Chrysler Alternator Rotor for Opens or Shorts	1K12
24-32.	Installation of Chrysler Alternator Grease Retainer	1K13
24-33.	Installation of Chrysler Alternator Rectifier End Shield Bearing	1K13
24-34.	Installation of Chrysler Alternator Drive End Shield Bearing	1K14
24-35.	Installation of Chrysler Alternator Pulley	1K14
24-36.	Installation of Chrysler Alternator Insulators	1K14
24-37.	Installation of Chrysler Alternator Positive Rectifier Assembly	1K14
24-38.	Installation of Chrysler Alternator Capacitor	1K5
24-39.	Installation of Chrysler Alternator Battery Output Insulator	1K15
24-40.	Installation of Chrysler Alternator Negative Rectifier Assembly	1K16
24-41.	Installation of Chrysler Alternator Stator	1K16
24-42	Exploded View of Electrosystems Alternator	1K18
24-43	Eight Resistor-Bank Load	1K19
24-44.	Removal of Slip Ring End Bearing (Electrosystems Alternator)	1K21
24-45.	Removal of Rectifier (Electrosystems Alternator)	1K21
24-46.	Removal of Drive End Head (Electrosystems Alternator)	1K22
24-47.	Removal of End Head Bearing (Electrosystems Alternator)	1K22

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-48.	Testing Rotor for Ground (Electrosystems Alternator)	1K23
24-49.	Testing Rotor for Shorts (Electrosystems Alternator)	1K23
24-50.	Installation of Bearing (Electrosystems Alternator)	1K23
24-51.	Installation of Rectifier (Electrosystems Alternator)	1K23
24-52.	Terminal Assembly (Electrosystems Alternator)	1L1
24-53.	Slip Ring End Bearing Assembly (Electrosystems Alternator)	1L1
24-54.	Testing Electrosystems Alternator	1L1
24-55.	Electrosystems Alternator Brush Installation	1L2
24-56.	Electrosystems Alternator Internal Wiring Diagram	1L3
24-57.	Lamar Regulator Check	1L15
24-58.	Lamar Overvoltage Check	1L15
25-1.	Seat Back Lock	2A19
25-2.	Lunbar Seat Bladder Installation	2A21
27-1.	Rod End Installation Method	2B5
27-2.	Control Cable Inspection Technique	2B5
27-3.	Cable Wear Patterns	2B6
27-4.	Internal Cable Wear	2B7
27-5.	Pulley Wear Patterns	2B9
27-6.	Control Column Assembly	2B13
27-7.	Flex (Universal) Joint Assembly	2B15
27-8.	Aileron Controls (typical)	2B17
27-9.	Aileron Rigging Tool	2B20
27-10.	Fabricated Aileron and Flap Rigging Tool	2B20
27-11.	Bellcrank Rigging Tool	2B22
27-12.	Aileron Rigging	2B23
27-13.	Rudder and Steering Pedal Assembly	2C3
27-14.	Rudder Controls	2C5
27-15.	Rudder Rigging Tool	2C7
27-16.	Clamping Rudder Pedals	2C7
27-17.	Rudder Rigging	2C8
27-18.	Fabricated Rudder Rigging Tool	2C8
27-19.	Rudder Travel Adjustments	2C9
27-20.	Rudder Trim Control	2C10
27-21.	Stabilator Controls	2C16
27-22.	Stabilator Rigging Tool	2C17
27-23.	Fabricated Stabilator Rigging Tool	2C18
27-24.	Stabilator and Trim Travel Adjustments	2C18
27-25.	Stabilator Trim Control (Floor Control)	2C20
27-26.	Methods of Securing Trim Cables	2C21
27-27.	Flap Controls	2D3
27-28.	Flap Stop Adjustment	2D5
27-29.	Flap Rigging Tool	2D5
27-30.	Flap Rigging	2D7

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
28-1.	Archer II Fuel System Diagram	2D14
28-2.	Archer III Fuel System Diagram (S/N's 2890006 and up)	2D15
28-3.	Locking Gas Cap	2D20
28-4.	Fuel Filter Bowl and Screen	2D23
28-5.	Plunger Fuel Pump	2D24
28-6.	Tolerances, Union Nut,and Tubing Nut	2E3
28-7.	Resistance Decade Test Box Set Up	2E9
28-8	Archer III Fuel Quantity Needle Deviation	2E10
28-9.	Fuel Quantity Transmitter Checking Jig	2E12
28-10	Fabricated Fuel Quantity Transmitter Checking Jig	2E13
32-1.	Main Gear Oleo Strut Assembly	2F1
32-2.	Orifice Replacement Tool	2F2
32-3.	Main Gear Installation	2F4
32-4.	Nose Gear Oleo Strut Assembly	2F8
32-5.	Retainer Ring Tool	2F10
32-6.	Nose Gear Installation	2F11
32-7.	Clamping Rudder Pedals in Neutral Position	2F14
32-8	Rudder Pedals at Neutral Angle	2F14
32-9.	Main Wheel Assembly	2F16
32-10.	Nose Wheel Assembly	2F18
32-11.	Brake Assembly	2F19
32-12.	Removal and Installation of Anchor Bolts	2F20
32-13.	Disc Brake Minimum Thickness	2F22
32-14.	Brake System Installations	2F22
32-15.	Brake Master Cylinder (Hand/Parking Brake)	2F23
32-16.	Toe Brake Installation	2G1
32-17.	Brake Cylinder 10-27, 10-30, and 17000 (Toe Brake)	2G2
33-1.	Archer II Annunciator Panel	2G21
33-2.	Archer III Annunciator Panel and Box Assembly	2G22
33-3	Archer II Strobe Light Connections	2H3
33-4	Archer III Landing Light Installation	2H6
33-5	Archer III Landing Light Adjustment	2H7
33-6	Archer III Strobe Light Connections	2H10
34-1.	Pitot/Static System	2H19
37-1.	Archer II Auxiliary Vacuum Pump Installation	2J1
37-2	Archer III Auxiliary Vacuum Pump Installation	2J2
37-3	Archer II and III Auxiliary Vacuum Electrical Schematic	2J3
51-1.	Skin Materials and Thickness	2K2
51-2	Baggage Compartment Inspection Holes Cutout Details	2K4
51-3.	Surface Scratches, Abrasions, or Ground-in-Dirt	2K8
51-4.	Deep Scratches, Shallow Nicks, and Small Holes	2K9
51-5.	Mixing of Epoxy Patching Compound	2K9
51-6.	Welding Repair Method	2K11
51-7.	Repairing of Cracks	2K11

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
51-8.	Various Repairs	2K12
51-9.	Repair of Stress Lines	2K13
51-10.	Repair of Impacted Damage	2K13
52-1.	Installation of Door Snubber	2L1
52-2.	Fabricated Tool for Baggage Door Lock	2L5
55-1.	Empennage Group Installation	2L12
55-2.	Methods of Securing Control Cables	2L13
55-3.	Stabilator Balance	2L13
55-4.	Control Surface Balancing Tool	2L14
55-5.	Rudder Balance	2L20
56-1.	Windshield Installation - Typical	3A22
56-2.	Single Pane Side Window Installation, - Typical	3A24
57-1.	Installation of Stall Strips	3B8
57-2.	Wing Installation	3B11
57-3.	Aileron and Flap Installation	3B19
57-4.	Aileron Balance Configuration	3B21
61-1.	Typical Nicks and Removal Method	3C4
61-2.	Archer II Propeller Installation	3C6
61-3.	Archer III Propeller Installation	3C7
71-1.	Static Rpm (Sea Level ± 500 Feet Pressure Altitude Only)	3D4
71-2.	Change in Static Rpm Vs. Engine Oil Temperature	3D5
71-3.	Psychromatic Chart	3D6
71-4.	Archer II Engine Installation	3D9
71-5.	Archer III Engine Installation	3D10
71-6.	Archer II Cowling	3D15
71-7.	Archer III Cowling (S/N’s 2890206 and up)	3D15
71-8.	Ice Detection System	3D22
73-1.	Carburetor	3E5
73-2.	Archer II Engine Primer	3E6
74-3.	Archer III Fuel Primer System	3E7
73-4.	Adjustment of Engine Controls	3E10
73-5	Archer III Instrument Cluster - Fuel Pressure Gauge	3E14
74-1.	T-100 Assembly and Timing Tool Kit	3E23
74-2.	Removing Coil Wedges	3F2
74-3.	Exploded View of 4200 Series Magneto	3F3
74-4.	Index Plate and Timing Plug	3F5
74-5.	Installation of Bearings and Bearing Plate	3F5
74-6.	Magneto Oil Seal Installation on T-100	3F7
74-7.	Magneto Internal Timing	3F7
74-8.	Bendix Magneto Inspection	3F9
74-9.	Contact Spring Inspection	3F10
74-10.	Impulse Coupling	3F10
74-11.	Magneto Timing Marks	3F12
74-12.	Timing Pointer	3F12

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
74-13.	Timing Kit Installed	3F12
74-14.	Breaker Compartment With Cast Timing Marks	3F12
74-15.	Stripping Tool	3F18
74-16.	Inserting Stripping Tool	3F18
74-17.	Cutting Insulation	3F18
74-18.	Removing Silicone Rubber From Wire	3F18
74-19.	Installation of Plug End Nut	3F19
74-20.	Flaring Out the Shielding	3F19
74-21.	Installation of Ferrule	3F19
74-22.	Driving Tool	3F19
74-23.	Installation in Housing	3F21
74-24.	Securing Wire in Housing	3F21
74-25.	Installation of Electrical Screw	3F21
74-26.	Installation of Insulation Sleeve	3F21
74-27.	Installation of Spring	3F22
74-28.	Removing Spark Plug Frozen to Bushing	3F22
74-29.	Archer II Ignition Switch Installation	3G2
74-30.	Archer III Starter Switch Installation	3G2
74-31.	Archer III Magneto Switch(es) Installation	3G3
77-1.	Exhaust Gas Temperature Probe Installation	3G14
78-1.	Archer II Exhaust System Inspection Points	3G20
78-2	Archer III Exhaust System Inspection Points	3G20
80-1.	Exploded View of Gear Reduction Starting Motor	3H14
80-2.	Turning Starting Motor Commutator	3H19
80-3.	Testing Motor Armature for Shorts	3H19
80-4.	Testing Motor Fields for Grounds	3H20
80-5.	No-Load Test Hookup	3H22
80-6.	Stall-Torque Hookup	3H22

Refer to Electrical Schematic Table of Contents 4A18

LIST OF CHARTS

FIGURE NO.	SUBJECT	GRID NO.
601	Leading Particulars and Principal Dimensions	1B18
1201	Thread Lubricants	1E5
1202	Type of Lubricants	1E6
2001	Maximum Distance Between Supports for Fluid Tubing	1F3
2002	Types of Metal Corrosion	1F9
2101	Troubleshooting Air Conditioner	1G5
2102	Troubleshooting Air Conditioning System	1G7
2103	Refrigerant Temperature Pressure	1G13
2104	Aluminum Tubing Torque (Archer II)	1G16
2105	Recommended Torque Specifications (Archer III)	1G16
2106	System Vacuum	1G19
2107	Compressor Oil Charge	1H7
2108	Compressor Misalignment and Idler Pulley Nominal Location	1H7
2109	Blower System Wire Color Codes	1I3
2401	Troubleshooting Alternator	1J9
2402	Troubleshooting (Battery)	1J13
2403	Prestolite Alternator Specifications	1K1
2404	Chrysler Alternator Specifications	1K17
2405	Electrosystems Alternator Specifications	1L3
2406	Alternator Belt Tension	1L4
2407	Hydrometer Reading and Battery Charge Percent Archer II, 12 Volt System	1L6
2408	Hydrometer Reading and Battery Charge Percent Archer III, 24 Volt System	1L10
2409	Electrolytic Temperature Corrections	1L10
2410	Specific Gravity Temperature Correction	1L11
2411	Discharge Rate	1L11
2412	Electrolyte Freezing Point	1L12
2413	(Archer II) Electrical System Component Loads	1L22
2414	(Archer III) Electrical System Component Loads	1L23
2701	Cable Tension Vs. Ambient Temperature	2B4
2702	Troubleshooting Aileron Control System	2B11
2703	Troubleshooting Rudder Control System	2C1
2704	Troubleshooting Rudder Trim Control System	2C2
2705	Troubleshooting Stabilator Control System	2C13
2706	Troubleshooting Stabilator Manual Trim Control	2C14
2707	Troubleshooting Flap Control System	2D2
2801	Troubleshooting (Fuel System)	2D16
2802	Transmitter/Fuel Gauge Tolerances	2E7
2803	Fuel Quantity Gauge Resistance/Tolerances Values	2E7
2804	14 Vdc Fuel Quantity Gauge Tolerance Values	2E8
2805	28 Vdc Fuel Quantity Gauge Resistance/Tolerance Values	2E9
2806	28 Vdc Fuel Quantity Gauge Tolerance Values	2E10
2807	Fuel Quantity Transmitter Calibration Tolerances	2E11
2808	Troubleshooting Fuel Quantity Indicator	2E14
3201	Troubleshooting (Landing Gear)	2E20

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
3202	Nose Gear Alignment Tolerances	2F13
3301	Archer III Annunciator Panel Function Description	2G15
3302	Troubleshooting Archer II Annunciator Panel	2G16
3303	Troubleshooting Archer III Annunciator Panel	2G18
3401	Troubleshooting Vertical Speed Indicator	2H21
3402	Troubleshooting Altimeter	2H22
3403	Troubleshooting Pitot/Static Tubes and Airspeed Indicator)	2H23
3404	Troubleshooting Attitude Deviation Indicator	2I4
3405	Troubleshooting Heading (Directional Gyro) Indicator	2I7
3406	Troubleshooting (Magnetic Compass)	2I8
3407	Troubleshooting Turn Indicator	2I10
3701	Troubleshooting Vacuum System	2I16
5101	List of Materials For Thermoplastic Repair	2K7
6101	Archer II Propeller Torque Limits	3C5
7101	Engine Fault Isolation	3C19
7102	Propeller Applicability	3D2
7103	Static Rpm With 76EM8S5-0-62 or 76EM8S14-0-62 Propellers	3D7
7301	Troubleshooting Fuel Pressure Gauge	3E12
7302	Archer III Instrument Calibration Chart	3E13
7401	Troubleshooting Archer II Magnetos	3E19
7701	Troubleshooting (Tachometer)	3G11
7702	Troubleshooting (Exhaust Gas Temperature Gauge) (Alcor)	3C24
7901	Troubleshooting Archer II Engine Oil Pressure Gauge	3H6
7902	Troubleshooting Archer II Engine Oil Temperature Gauge	3H6
7903	Troubleshooting Archer III Engine Oil Pressure Gauge	3H7
7904	Troubleshooting Archer IIi Engine Oil Temperature Gauge	3H8
8001	Troubleshooting (Starter)	3H14
8002	Starting Motor Specifications	3H23
9101	Flare Fitting Torques	3I7
9102	Recommended Nut Torques	3I8
9103	Decimal Conversions	3I10
9104	Torque Conversion Tables	3I11
9105	Conversion Table Notes	3I12
9106	Metric Conversion Tables	3I13
9107	Decimal/Millimeters Equivalents of Drill Sizes	3I6
9108	Ball Diameters For Testing Hose Restrictions	3I8
9109	Hose Specifications	3I9
9110	List of Consumable Materials	3I20
9111	Vender Information	3J4
9112	Electrical Wire Coding	3J7
9113	Electrical Symbols	3J8

CHAPTER

4

AIRWORHTINESS LIMITATIONS

1A17

Island Enterprises

CHAPTER 4 - AIRWORTHINESS LIMITATIONS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVIT
4-00-00	AIRWORTHINESS LIMITATIONS	1A20	
4-00-00	General	1A20	

AIRWORTHINESS LIMITATIONS

GENERAL

Airworthiness limitations are FAA approved and specify inspections and maintenance required under Federal Air Regulations Parts 43 and 91.

The following limitations relate to fatigue life and components of the PA-28-181 airplane:

1. Safe life of the airframe structure information will be issued when available.
2. Safe life limit of propeller blades is unlimited.

— NOTE —

Refer to LIMITATIONS in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for detailed delineation of airplane flight limitations. Mandatory replacement time and inspection intervals of life limited parts are in chapter 5 of the Piper maintenance manual.

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

5

TIME LIMITS AND MAINTENANCE CHECKS

1A21

CHAPTER 5 - TIME LIMITS/MAINTENANCE CHECKS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
5-00-00	GENERAL	1A23	
5-10-00	TIME LIMITS	1A24	
5-10-00	Inspection Requirements	1A24	
5-10-00	Preflight Checks	1A24	
5-10-00	Over Limits Inspection	1A24	
5-20-00	SCHEDULED MAINTENANCE	1B1	
5-20-00	Periodic Inspections	1B1	
5-40-00	PROGRESSIVE INSPECTION	1B11	
5-50-00	UNSCHEDULED MAINTENANCE CHECKS	1B12	
5-50-00	Special Inspections as Required, Upon Condition	1B12	

GENERAL

This chapter provides instructions for conducting inspections. Inspections are described in inspection requirements and preflight checks. Repair or replacement instructions for unserviceable components are in the section covering the applicable aircraft system.

— WARNING —

Ground magneto primary circuit before performing any engine work.

THIS SPACE INTENTIONALLY LEFT BLANK

TIME LIMITS

A. INSPECTION REQUIREMENTS

Required inspection procedures are listed in periodic inspections. Inspection procedure is divided as follows: Propeller, Engine, Cabin, Fuselage and Empennage, Wing, Landing Gear, Float Group, Operational Inspection, and General. The first column in each group lists the inspection or procedure to be performed. The second column is divided into four columns indicating required inspection intervals of 50 hours, 100 hours, 500 hours, and 1000 hours. Inspection or operation is required each inspection interval as indicated by a circle (O). Refer to the applicable section in this manual for part access or part removal instructions. Use forms (Piper Part no. 230 1039) furnished by the Piper Factory Service Department, available through Piper dealers or distributors for inspections

B. PREFLIGHT CHECKS

Perform a thorough preflight and walk-around check in addition to inspection intervals in Periodic Inspections. Pilot or mechanic must include preflight check as normal procedure necessary for safe aircraft operation. Refer to Pilot's Operating Handbook for items that must be checked.

C. OVER LIMITS INSPECTION

Check appropriate manufacturer's instructions if aircraft components have exceeded maximum operational limits.

THIS SPACE INTENTIONALLY LEFT BLANK

SCHEDULED MAINTENANCE CHECKS

PERIODIC INSPECTIONS

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
A. PROPELLER GROUP				
1. Inspect spinner and back plate	O	O	O	O
2. Inspect blades for nicks and cracks.	O	O	O	O
3. Inspect for grease and oil leaks	O	O	O	O
4. Lubricate propeller. Refer to chapter 12.)	O	O	O	O
5. Inspect spinner mounting brackets.		O	O	O
6. Inspect propeller mounting bolts and safety. Check torque, if safety is broken		O	O	O
7. Inspect hub parts for cracks and corrosion		O	O	O
8. Inspect complete propeller and spinner assembly for security, chafing, cracks, deterioration, wear, and proper installation.		O	O	O
9. Recondition propeller. (See Note 5.)				
B. ENGINE GROUP.				
— WARNING — ***Ground magneto primary circuit prior to beginning any engine work.***				
— NOTE — ***Read note 6 prior to beginning this inspection group.***				
1. Remove engine cowling. Inspect for damage	O	O	O	O
2. Clean and inspect cowling for cracks, distortion, and loose or missing fasteners		O	O	O
3. Drain oil sump. (See Note 7.)	O	O	O	O
4. Clean suction oil strainer at oil change. Inspect strainer for foreign particles.	O	O	O	O
5. Clean pressure oil strainer or change full flow (cartridge type) oil filter element. Check strainer or element for foreign particles	O	O	O	O
6. Inspect oil temperature sender unit for leaks and security		O	O	O
7. Inspect oil lines and fitting for leaks, security, chafing, dents, and cracks. (See Note 8.)	O	O	O	O
8. Clean and inspect oil radiator cooling fins		O	O	O
9. Remove and flush oil radiator			O	O
10. Fill engine with oil per lubrication chart. (Refer to chapter 12.)	O	O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
B. ENGINE GROUP (continued)				
— CAUTION — ***Use caution not to contaminate vacuum pump with cleaning fluid. (Refer to latest revision Lycoming Service Instruction No. 1221.)***				
11. Clean engine.		O	O	O
12. Inspect condition of spark plugs (clean and adjust gap as required, adjust per latest revision Lycoming Service Instruction no. 1042.		O	O	O
— NOTE — ***If fouling of spark plugs are apparent, rotate bottom plugs to upper plugs.***				
13. Inspect spark plug cable leads and ceramics for corrosion and deposits	O	O	O	O
14. Check cylinder compression. (Reference: AC 43.13-1A.)		O	O	O
15. Inspect cylinders for cracked or broken fins. (See Note 9.)		O	O	O
16. Inspect rocker box covers for evidence of oil leaks. If found, replace gasket; tighten cover screws to a torque of 50 inch-pounds. (See Notes 10.)	O	O	O	O
17. Inspect ignition harness and insulators for high tension leakage and continuity		O	O	O
18. Inspect magneto points for condition and proper clearance		O	O	O
19. Inspect magneto for oil leakage		O	O	O
20. Inspect breaker felts for proper lubrication.		O	O	O
21. Inspect distributor block for cracks, burned areas, corrosion, and height of contact springs			O	O
22. Check magnetos to engine timing		O	O	O
23. Overhaul or replace magnetos. (See Note 11.)				
24. Remove air filter and tap gently to remove dirt particles Replace as required	O	O	O	O
25. Drain carburetor and clean inlet line fuel strainer.	O	O	O	O
26. Inspect condition of carburetor heat air door and box. (See Note 12.)	O	O	O	O
27. Inspect vent lines for evidence of fuel or oil seepage	O	O	O	O
28. Inspect intake seals for leaks and clamps for tightness.	O	O	O	O
29. Inspect all air inlet duct hoses. (Replace as per latest revision Piper Service Bulletin No. 356.)	O	O	O	O
30. Inspect flexible fuel lines condition		O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
B. ENGINE GROUP (continued)				
31. Replace flexible fuel lines. (See Note 8.)				O
32. Inspect fuel system for leaks	O	O	O	O
33. Clean electric fuel pump screen and check operation.	O	O	O	O
34. Overhaul or replace engine driven and electric fuel pumps. (See Note 11.)				
35. Remove and clean fuel filter bowl and screen Clean at least every 90 days	O	O	O	O
36. Inspect vacuum pump and lines		O	O	O
37. Overhaul or replace vacuum pump. (See Note 11.)				
38. Inspect throttle, carburetor heat, mixture, and propeller governor controls for security, travel, and operating conditions.		O	O	O
39. Inspect exhaust stacks, connections, and gaskets. Replace gaskets as required. (Refer to chapter 78.)		O	O	O
40. Inspect muffler, heat exchanger and baffles. (Refer to latest revision of Piper Service Bulletin 879 and chapter 78.)		O	O	O
— NOTE — ***It is recommended that all airplanes be fitted with a new muffler at or before 1000 hour period of muffler use.***				
41. Inspect breather tube for obstructions and security.		O	O	O
42. Inspect crankcase for cracks, leaks, and security of seam bolts		O	O	O
43. Inspect engine mounts for cracks and loose mountings.		O	O	O
44. Inspect all engine baffles.		O	O	O
45. Inspect all wiring connected to the engine or accessories	O	O	O	O
46. Inspect rubber engine mount bushings for deterioration. Replace as required		O	O	O
47. Inspect firewall seals		O	O	O
48. Inspect alternator drive belt condition and tension		O	O	O
49. Lubricate alternator idler pulley (if installed) per lubrication chart. ***DO NOT lubricate if sealed bearings are installed***.		O	O	O
50. Inspect condition of alternator and starter, and related electrical connections		O	O	O
51. Inspect security of alternator mounting		O	O	O
52. Inspect air conditioning compressor oil level. (See Note 13.)		O	O	O
53. Inspect compressor belt condition and tension. (90 to 100 lb.)		O	O	O
54. Inspect compressor clutch security and wiring. (See Note 14.)		O	O	O
55. Inspect security of compressor mounting		O	O	O
56. Check fluid in brake reservoir. Fill as required.	O	O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
B. ENGINE GROUP (continued)				
57. Lubricate all controls. (Refer to chapter 12.)		O	O	O
58. Overhaul or replace propeller governor. (See Note 11.)				
59. Complete engine overhaul or replace with factory rebuilt. (Refer to latest revision of Textron Lycoming Service Letter 201.)				
60. Install engine cowl	O	O	O	O
C. CABIN GROUP				
1. Inspect cabin entrance, doors, and windows for damage and operation.		O	O	O
2. Inspect window sealants for cracks and deterioration. Reseal if necessary		O	O	O
3. Inspect upholstery for tears		O	O	O
4. Inspect seats, seat belts, security brackets, and bolts		O	O	O
5. Check trim operation. (See Note 15.)		O	O	O
6. Inspect rudder pedals		O	O	O
7. Inspect parking brake and brake handle for operation and cylinder leaks.		O	O	O
8. Inspect control wheels, column, pulleys, and cables for condition. (See Note 16.)		O	O	O
9. Inspect flap control cable attachment bolt. (Refer to latest revision of Piper Service Bulletin 965.)		O	O	O
10. Inspect landing, navigation, cabin, and instrument lights.	O	O	O	O
11. Inspect instruments, lines, and attachments		O	O	O
12. Inspect gyro operated instruments and electric turn and bank. (Overhaul or replace as required.)		O	O	O
13. Replace central air filter		O	O	O
14. Clean or replace vacuum regulator filter.		O	O	O
15. Inspect altimeter. Calibrate altimeter system per FAR 91._____ if appropriate		O	O	O
16. Check fuel selector valve operation		O	O	O
17. Inspect condition of heater controls and ducts.		O	O	O
18. Inspect air vents condition and operation		O	O	O
19. Inspect condition of air conditioning ducts.		O	O	O
20. Remove and clean air conditioning evaporator filter		O	O	O
D. FUSELAGE AND EMPENNAGE GROUP				
1. Remove inspection plates and panels		O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
D. FUSELAGE AND EMPENNAGE GROUP (continued)				
2. Inspect baggage door, latch, and hinges		O	O	O
3a. Archer II - Inspect battery, box, cables, and securing straps. Inspect at least every 30 days. Flush box as required and fill battery per box instructions	O	O	O	O
3b. Archer III - Inspect battery condition and security. Clean and recharge acid recovery (vent) jar. (Refer to Chapter 24)	O	O	O	O
4. Inspect electronic installation		O	O	O
5. Inspect bulkheads and stringers for damage		O	O	O
6. Inspect antenna mounts and electric wiring		O	O	O
7. Inspect air conditioning system for Freon leaks. (See Note 13.)		O	O	O
8. Inspect Freon level in sight gauge of receiver-dehydrator. (Refer to chapter 21 and see Note 13.)	O	O	O	O
9. Inspect air conditioning condenser air scoop rigging. (See Note 23)	O	O	O	O
10. Inspect fuel lines, valves, and gauges for damage and operation		O	O	O
11. Clean screen in fuel pumps		O	O	O
12. Inspect security of all lines		O	O	O
13. Inspect vertical fin and rudder surfaces for damage		O	O	O
14. Inspect rudder hinges, horn, and attachments for damage and operation		O	O	O
15. Inspect rudder control stops. Verify stops are not loose an locknuts are tight		O	O	O
16. Inspect vertical fin attachments		O	O	O
17. Inspect rudder hinge bolts for excess wear. Replace as required.		O	O	O
18. Inspect stabilator surfaces for damage		O	O	O
19. Inspect stabilator, tab hinges, horn, and attachments for damage and operation		O	O	O
20. Inspect stabilator control stops, verify stops are not loose and locknuts are tight		O	O	O
21. Inspect stabilator attachments. (See latest Piper Service Bulletin 856.)		O	O	O
22. Inspect stabilator and tab hinge bolts and bearings for excess wear. Replace as required		O	O	O
23. Inspect stabilator trim mechanism		O	O	O
24. Inspect aileron, rudder, stabilator primary control cables, and stabilator trim cables, turnbuckles, guides, and pulleys for safety, damage, and operation. (See Note 16.)		O	O	O
25. Use a tensiometer to inspect all cable tensions. (See Note 17.)		O	O	O
26. Clean and lubricate stabilator trim drum screw		O	O	O
27. Clean and lubricate all exterior needle bearings		O	O	O
28. Lubricate per lubrication chart. (Refer to chapter 12.)	O	O	O	O
29. Inspect anti-collision light for security and operation		O	O	O
30. Inspect security of autopilot bridle cable clamps. (See Note 18.)		O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
D. FUSELAGE AND EMPENNAGE GROUP (continued)				
31. Inspect all air ducts, electrical leads, lines, radio antenna leads, and attaching parts for security, routing, chafing, deterioration, wear, and proper,installation.....		O	O	O
32. Inspect ELT installation, battery and antenna condition. (See the latest revision Piper Service Letter no. 820.).....		O	O	O
34. Install inspection plates and panels.....		O	O	O
E. WING GROUP				
1. Remove inspection plates and fairings.....		O	O	O
2. Inspect surfaces and tips for damage, loose rivets, and condition of walk-way.....		O	O	O
3. Inspect tip light shield for cracks, bonds, corrosion, or other damage.....		O	O	O
4. Inspect aileron hinges and attachments.		O	O	O
5. Inspect aileron control stops, verify stops are not loose and locknuts are tight.		O	O	O
6. Inspect aileron cables, pulleys, and bellcranks for damage and operation. (See Note 16.).....		O	O	O
7. Inspect flaps and attachments for damage and operation.....		O	O	O
8. Inspect condition of bolts used with hinges. Replace as required.....		O	O	O
9. Lubricate per lubrication chart. (Refer to chapter 12.).....	O	O	O	O
10. Inspect wing attachment bolts and brackets.		O	O	O
11. Inspect wing fore and aft attach fittings for security, corrosion and condition. See to note 25.).....		O	O	O
12. Inspect fuel tanks and lines for leaks and water. (See Note 23.).....		O	O	O
13. Fuel tanks marked for capacity.....		O	O	O
14. Fuel tanks marked for minimum octane rating.....		O	O	O
15. Inspect fuel cell vents. (See Note 20.).....		O	O	O
16. Inspect all air ducts, electrical leads, lines, and attaching parts for security, routing, chafing, deterioration, wear, and proper installation.....		O	O	O
17.Install inspection plates and fairings.....		O	O	O
F. LANDING GEAR GROUP				
1. Inspect oleo struts for proper extension. Check fluid level as required.....	O	O	O	O
2. Inspect nose gear steering control and travel.....		O	O	O
3. Inspect wheels for alignment.....		O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
F. LANDING GEAR GROUP (continued)				
4. Put airplane on jacks		O	O	O
5. Inspect tires for cuts, uneven or excessive wear, and slippage		O	O	O
6. Remove wheels, clean, check, and repack bearings		O	O	O
7. Inspect wheels for cracks, corrosion, and broken bolts		O	O	O
8. Inspect tire pressure	O	O	O	O
9. Inspect brake lining and disc for condition and wear		O	O	O
10. Inspect brake backing plates for condition and wear		O	O	O
11. Inspect brake lines.		O	O	O
12. Inspect shimmy dampener.		O	O	O
13. Inspect gear forks for damage		O	O	O
14. Insect Archer II cast main landing gear oleo housing torque ling attach lugs for cracks. (Refer to chapter 32 and see note 26)		O	O	O
15. Inspect oleo struts for fluid leaks and scoring		O	O	O
16. Inspect gear struts and mounting bolts for condition and security.		O	O	O
17. Inspect torque links for cracks, bolts for condition and security. (Serial No's. 28-7690001 thru 28-7890231 refer to latest Piper Service Letter 842.)		O	O	O
18. Check torque link assembly for excessive side play		O	O	O
19. Inspect all hydraulic lines, electrical leads, and attaching parts for security, routing, chafing, deterioration, wear, and proper installation		O	O	O
20. Lubricate per lubrication chart. (Refer to chapter 12.)	O	O	O	O
21. Remove airplane from jacks		O	O	O
G. FLOAT GROUP (Applicable to float equipped Archer I and Archer II only)				
1. Inspect float attachment fittings		O	O	O
2. Inspect floats for damage		O	O	O
3. Inspect pulleys and cables (see Note 16)		O	O	O
H. OPERATIONAL INSPECTION				
1. Check fuel pump and fuel tank selector	O	O	O	O
2. Check fuel quantity, pressure and flow readings	O	O	O	O
3. Check oil pressure and temperature	O	O	O	O
4. Check alternator output	O	O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

— NOTE —

Refer to Notes 1, 2, 3, and 4 before performing inspections.)

NATURE OF INSPECTION	Inspection time (hrs)			
	50	100	500	1000
H. OPERATIONAL INSPECTION (continued)				
5. Check manifold pressure	O	O	O	O
6. Check carburetor air	O	O	O	O
7. Check parking brake	O	O	O	O
8. Check operation of auxiliary vacuum pump system, if installed. (See note 21.)	O	O	O	O
9. Check vacuum gauge	O	O	O	O
10. Check gyros for noise and roughness	O	O	O	O
11. Check cabin heater operation	O	O	O	O
12. Check magneto switch operation	O	O	O	O
13. Check magneto rpm variation	O	O	O	O
14. Check throttle and mixture operation. (See latest revision Piper Service Bulletin No. 448.)	O	O	O	O
15. Check propeller smoothness	O	O	O	O
16. Perform maximum power static rpm check per Chapter 71	O	O	O	O
17. Check engine idle.	O	O	O	O
18. Check electronic equipment operation.	O	O	O	O
19. Check air conditioner compressor clutch operation.	O	O	O	O
20. Check air conditioner condenser scoop operation	O	O	O	O
21. Check operation of autopilot, including automatic pitch trim, and manual electric trim (if installed). (Refer to note 22.)	O	O	O	O
I. GENERAL				
1. Verify aircraft conforms to FAA Specifications	O	O	O	O
2. Comply with all latest revision FAA Airworthiness Directives	O	O	O	O
3. Comply with all latest revision Manufacturers Service Bulletins and Letters	O	O	O	O
4. Check for proper flight manual	O	O	O	O
5. Verify aircraft papers in proper order	O	O	O	O

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

NOTES

1. Refer to last card of Piper parts price list Aerofiche, for a check list of current revision dates to Piper inspection reports and manuals.
2 All inspections or operations are required each inspection interval as indicated by a (O). Both the annual and 100 hour inspections are complete aircraft inspections, identical in scope. The 500 and 1000 hour inspections are extensions of the annual or 100 hour inspection and require more detailed aircraft examination, overhaul, or replacement of major components. Inspections must be by FAA authorized persons.
3. Piper Service Bulletins are of special importance and Piper considers compliance mandatory.
4. Piper Service Letters are product improvements and service hints pertaining to aircraft servicing, and require careful attention.
5. Recommended flight time between reconditioning of Sensenich fixed-pitch metal propellers is 1000 hours, if propeller has no prior damage. Reconditioning is removal of fatigued surface metal and accumulated small nicks too numerous to repair individually. Contact a Sensenich factory approved repair station. (Refer to latest revision of Sensenich Service Letter no. 80-1.)
6. Power plant inspections are based on the engine manufacturer's operator's manual. Changes to the engine manufacturer's operator's manual will supersede or supplement inspections outlined lined in this report. Refer to latest revision of Textron Lycoming Service Letter No. 114
7. Intervals between oil changes can be increased as much as 100 percent on engines equipped with full flow cartridge type oil filters, if element is replaced each 50 hours of operation. Refer to latest revision Lycoming Service Bulletin 480 for additional information.
8. Replace engine compartment flexible hoses (fuel, oil, etc.) every 1000 hours, 8 years or at engine TBO, whichever comes first. Refer to latest revision of Textron Lycoming Service Bulletin 240 and latest revision of Textron Lycoming Service Letter L201B.
9. Check cylinders for evidence of excessive heat (look for burned paint on cylinders. This condition indicates internal cylinder damage and, if found, its cause must be found and corrected before aircraft returns to service.

   Heavy discoloration and appearance of seepage at cylinder head and barrel attachment area is usually due to emission of thread lubricant used during barrel assembly at the factory, or by slight gas leakage stopping after cylinder is in service awhile. This condition is not harmful to engine performance and operation. If leakage exceeds these condition, replace cylinder.
10. At every 400 hours of engine operation, remove rocker box covers and check for freedom of valve rockers when valves are closed. Look for evidence of abnormal wear or broken parts in area of valve tips, valve keeper, springs, and spring seat. If wear is found, remove the cylinder and all components (including piston and connecting rod assembly) and inspect for further damage. Replace any parts not conforming to limits in latest revision for Textron Lycoming Service Table of Limits SSPO 1776.
11. Replace (or overhaul, if applicable) at engine overhaul or 5 years, whichever comes first. (For engine overhaul, refer to latest revision of Textron Lycoming Service Bulletin 240 and Service Letter L201).

SCHEDULED MAINTENANCE CHECKS (continued)

PERIODIC INSPECTIONS (continued)

NOTES (continued)

12. Check throttle body attaching screws for tightness. Tighten screws to a torque of 40 to 50 inch-pounds.
13. Compressor oil level should not be checked unless a Freon leak has occurred, requiring an addition of Freon to the system. ***CAUTION: Environmental regulations may require special equipment and procedures be utilized when charging air conditioning system with Freon.***
14. Clean any traces of oil from clutch surface.
15. If airplane has electric trim system refer to latest revision Piper Service Bulletin no. 556.
16. Examine cables for broken strands by wiping the cable with a cloth along the entire length of the cable. Visually inspect the cable thoroughly for damage not detected by the cloth. Replace damaged or frayed cables. Refer to Chapter 27 and the latest edition of FAA Advisory Circular 43.13-1A, Paragraph 198.
17. Maintain cable tensions specified in chapter 27.
18. Check security and condition of autopilot servo bridle cables, clamps, and sheer pin per latest revision of Piper Service Letter No. 695.
19. Replace flexible fuel tank supply hose at engine overhaul.
20. Replace fuel tank vent line flexible connections as required, but no later than 1000 hours time-in-service.
21. The Airborne auxiliary vacuum pump/motor assembly (4A3-1) must be removed from service and replaced at 500 hours operating time as indicated on the elapsed time indicator, or at 10 years of installed time in the aircraft, whichever comes first.
22. Refer to Flight Manual Supplement for preflight and flight check for intended function in all modes.
23. Pressure check all fluid hoses in fuselage and wing areas after 10 years time-in-service. Visually check for leaks. Hoses that pass inspection may remain in service and checked thereafter each five years time-in-service.
24. Replace compressor belt each 1000 hours time-in-service, or 3 years, whichever comes first.
25. Inspect area around fore and aft attach fittings for evidence of wet interior insulation. Replace as necessary.
26. On Archer II airplanes used for training, and utilizing cast main gear cylinder housings, inspect the housing radii at the torque link attach lugs for cracks after the first 2000 hours time-in-service. Thereafter, the inspection must be performed each 100 time-in-service. Replacing the cast housings with a forged housings (Piper p/n 65490-0) will eliminate the need for this inspection.

— NOTE —

Obtain printed copies of the 100 Hour/Annual Inspection Report from Piper Service Sales, as Piper Part Number 230 1039.

PROGRESSIVE INSPECTION

The progressive continuous inspection was designed to permit the best aircraft utilization by scheduling inspections through use of a planned inspection schedule. The programmed inspection schedule has been prepared in manual form available from Piper Service Sales - as Piper Part no. 761 497. Refer to last card Piper Parts Price List - Aerofiche (revision check list) for latest revision of inspection manual.

THIS SPACE INTENTIONALLY LEFT BLANK

UNSCHEDULED MAINTENANCE CHECKS

SPECIAL INSPECTIONS AS REQUIRED, UPON CONDITION

Special inspections supplement scheduled inspections (outlined in the Periodic Inspections), and include inspections required at intervals not compatible with airframe operating time or inspection intervals. Typical of this type are:

— CAUTION —

Any of the following items resulting in airframe, engine mount, or wing damage will require compliance with the latest revision of SB 886.

1. Inspections required due to special conditions or incidents requiring immediate inspection before further safe flight.
2. Hard or Overweight Landing. Inspection must be performed after a known rough landing or when landing while aircraft is known to exceed design landing weight. Check following areas and items:
   a. Wings - for wrinkled skins, loose, or missing rivets.
   b. Fuel leaks around fuel tanks.
   c. Wing spar webs, bulkheads, wing and fuselage stringers, and skins for any overstress or damage.
   d. Check alignment to eliminate any doubt of damage.
3. Severe Turbulence Inspection. The same items and locations must be checked as per Hard or Overweight Landings. The following must be checked:
   a. Top and bottom fuselage skins for loose or missing rivets and wrinkled skins.
   b. Empennage skins and attachments.
4. Engine overspeed, sudden stoppage, loss of oil, over temperature, and lightning strike: Check with Textron Lycoming for necessary corrective repair or replacement.

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

6

DIMENSIONS AND AREAS

1B15

CHAPTER 6 - DIMENSIONS AND AREAS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
6-10-00	DIMENSIONS	1B18	
6-20-00	STATION REFERENCE LINES	1B22	
6-20-00	Archer II	1B22	
6-20-00	Archer III	1B24	
6-30-00	ACCESS AND INSPECTION PROVISIONS	1C2	

THIS PAGE INTENTIONALLY LEFT BLANK

DIMENSIONS

Aircraft dimensions are shown in Figure 6-1 and listed in chart 601.

CHART 601. LEADING PARTICULARS AND PRINCIPAL DIMENSIONS

MODEL	PA-28-181
ENGINE	
Manufacturer	Avco-Lycoming
Model	O-360-A4M (with Slick Magnetos) O-360-A4A (with Bendix Magnetos)
Rated Horsepower at Propeller rpm	180/2700 rpm
Oil Sump Capacity	8 U.S. qts
Fuel, Aviation Grade, Minimum	100 Low Lead
Magneto, Slick	Left 4051 or 4151 or 4251 (1) Right 4050 or 4150 or 4250 (1) Left 4371 (5) Right 4370 (1)
Magneto, Bendix	Left S4LN-21 (with Integral Filter) Right S4LN-204
Magneto Timing	25° btc
Spark Plug Gap Setting	0.017 to 0.021 inch
Firing Order	1-3-2-4
Starter, Prestolite, 12 Volt(Archer II)	MZ4206
Starter, 24 Volt - Lycoming (Archer III)	Lyc # LW 15572
Alternator	Chrysler 3656624 (2) Chrysler 4111810 (60 amp) (3) Electro Systems ES4020 (60 amp) (4) Presolite ALY-6422 (60 amp) Electrosystems ES 4032-99109-13 (70 amp) (5)
PROPELLER	
FIXED PITCH	
Manufacturer	Sensenich
Model	76EM8S5-0-60 (28-7690001 - 28-7790607 incl)

(1) Serial Numbers 28-7990091, 28-7990102 thru 28-7990110, 28-7990113, and up.
(2) Serial Numbers 28-7690001 to 28-7990257 inclusive.
(3) Serial Numbers 28-7990258 and up.
(4) Serial Numbers 28-7690001 and up.
(5) Serial Numbers 2890206 and up

CHART 601. LEADING PARTICULARS AND PRINCIPAL DIMENSIONS (continued)

MODEL	PA-28-181 76EM8S5-0-62 (28-7890001 and up, and 2890001 - 2890205)
PROPELLER (cont.)	
FIXED PITCH (cont.)	
Manufacturer	Sensenich
Model	76EM8S14-0-62 (2890206 and up)
Diameter Max/Min	76.0 in.
FUEL SYSTEM	CAPACITY
Left Wing Tank	25 gal.
Right Wing Tank	25 gal.
Total	50 gal.
Total Unusable	2 gal.
LANDING GEAR	
Type	Fixed
Shock Strut Type	Combination Air-Oil
Wheel Tread	10.0 ft
Wheel Base	6 ft 6.9 in
Turning Radius, Nose Wheel 13 ft	
Nose Wheel Travel	30° ± 1° Left & Right
Wheel, Nose	6:00 x 6
Wheel, Main	6:00 x 6
Brake Type (6)	
Tires, Nose	6:00 x 6, 4 Ply Rating
Tires, Main	6:00 x 6, 4 Ply Rating or 6:00 x 6, 6 Ply Rating
Tire Pressure, Nose	18 psi
Tire Pressure, Main	24 psi

(6) Refer to Parts Catalog for wheels, brake part number and vendor.

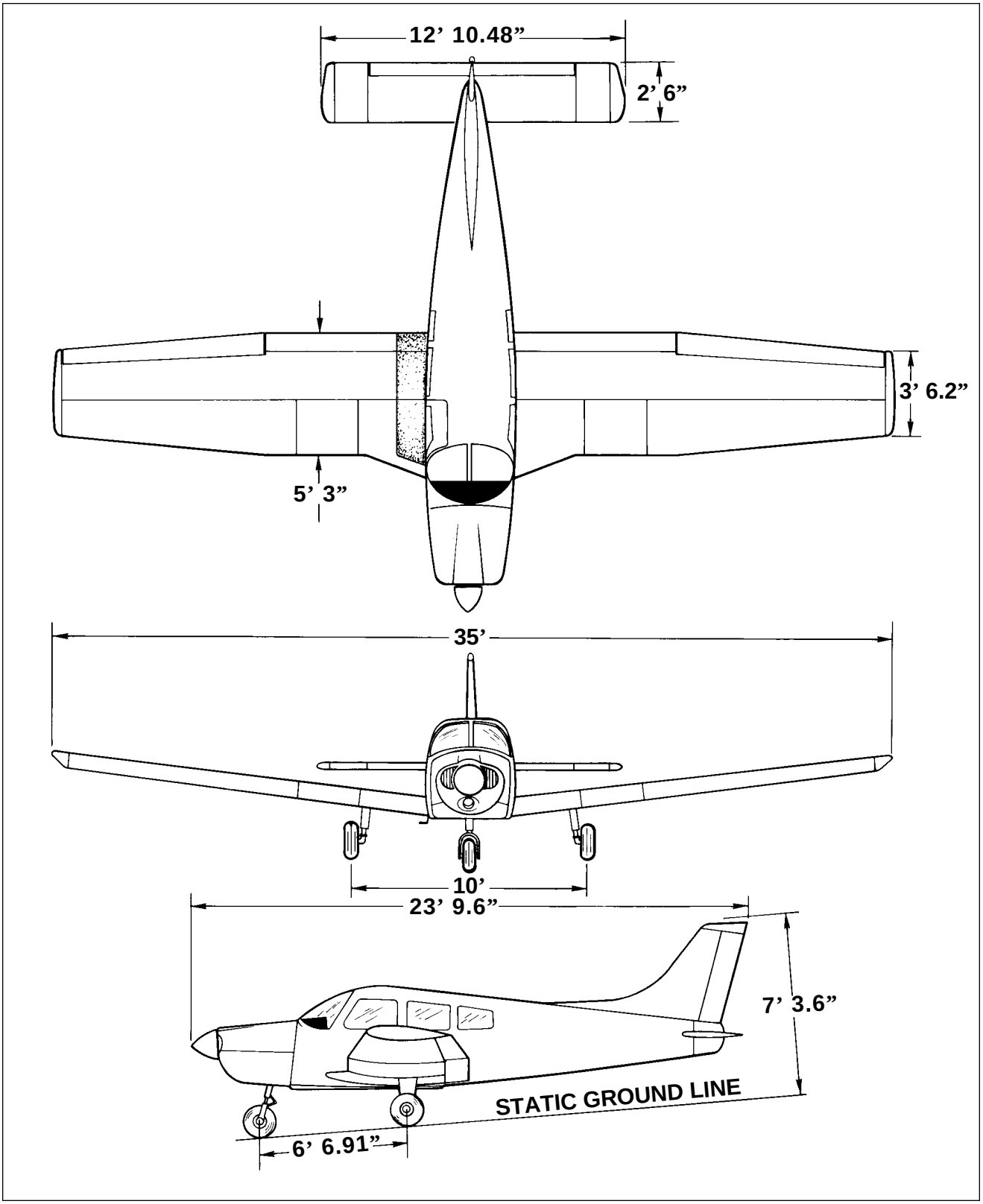


Figure 6-1. Three View - Archer II

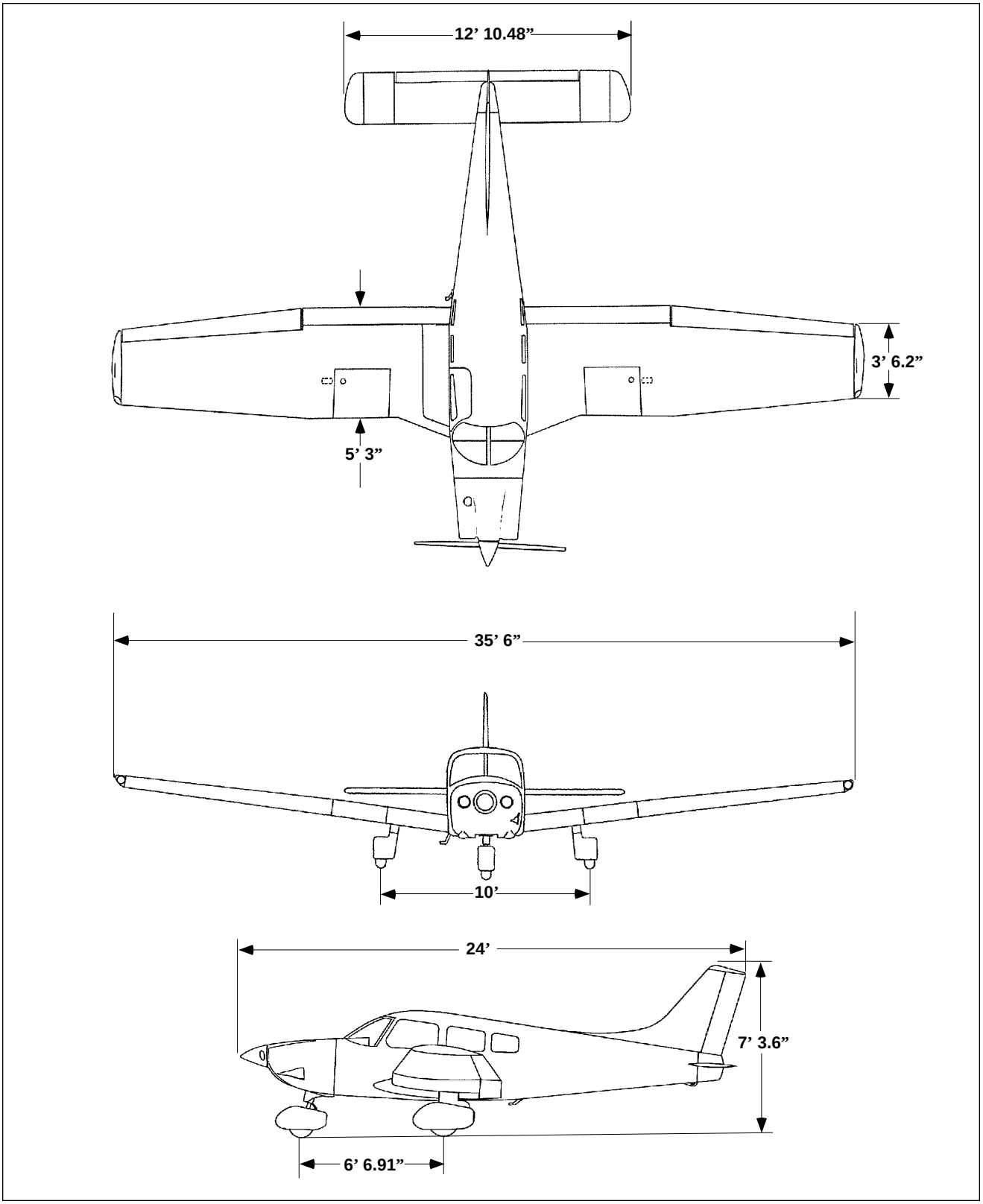


Figure 6-2. Three View - Archer III

STATION REFERENCE LINES

A. Archer II

Use the following location references to aid in maintenance and servicing the Archer II (refer to Figure 6-3). The fuselage station (Sta), wing station (WS), butt line (BL) and water line (WL) are reference points measured in inches laterally, horizontally or vertically from a given reference line, and show station locations of structural members. Fuselage station 0 is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section. Butt line station 0 is the airplane centerline. WL station 0 is 20.5 inches below cabin floor measured at rear wing spar with airplane level.

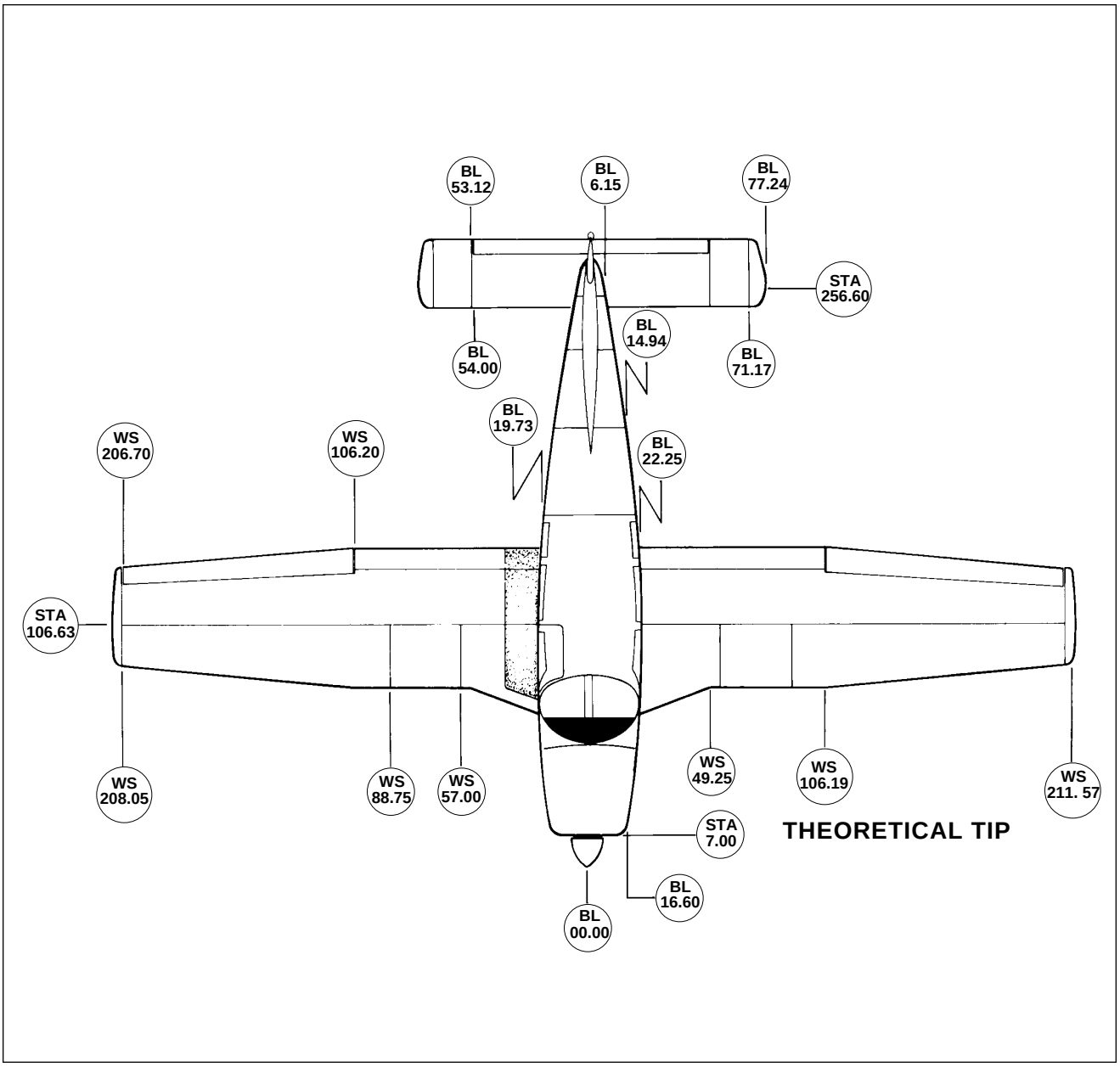


Figure 6-3. Station Reference Lines - Archer II (1 of 2)

STATION REFERENCE LINES (continued)

A. Archer II (continued)

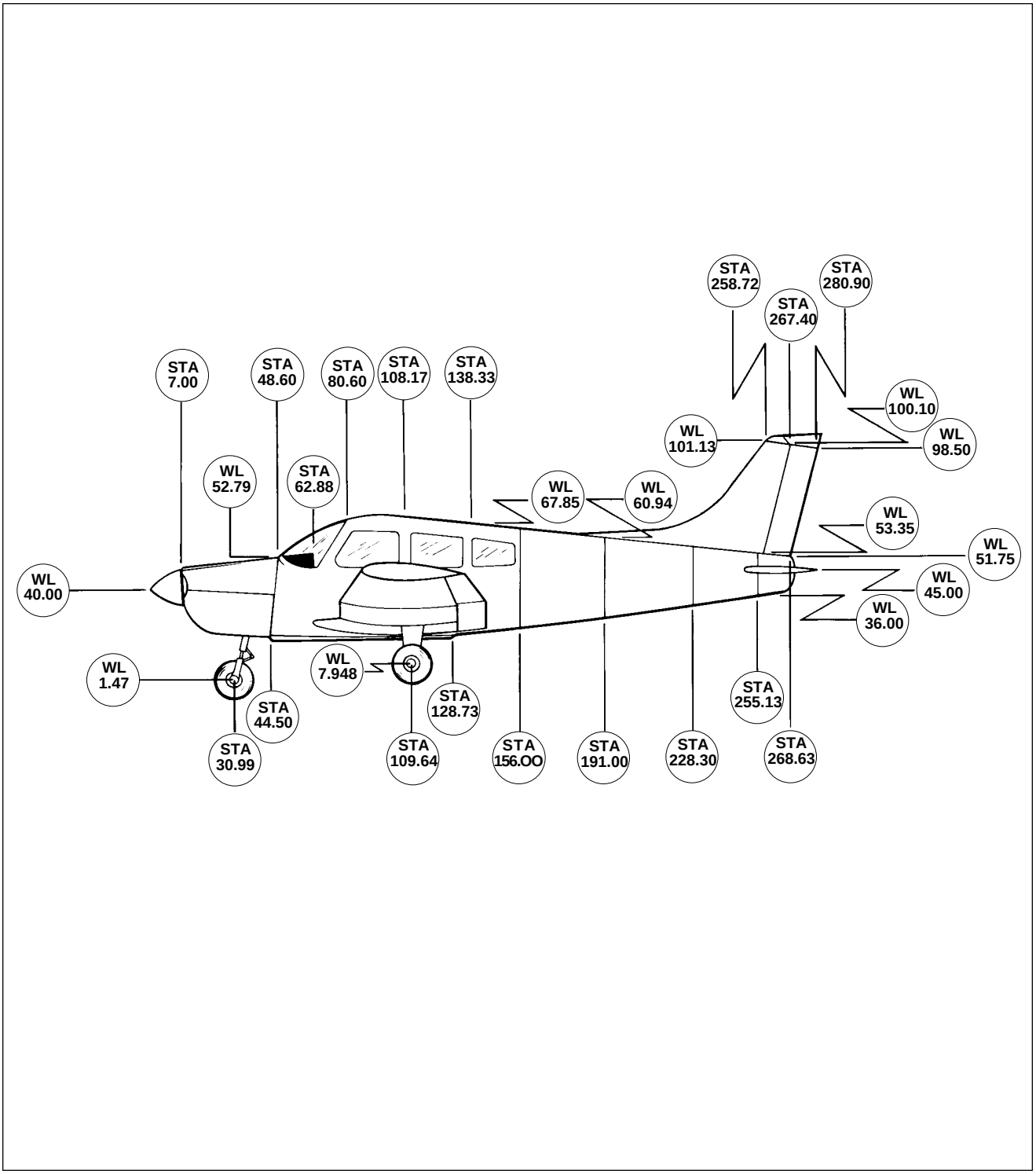


Figure 6-3. Station Reference Lines - Archer II (2 of 2)

STATION REFERENCE LINES (continued)

B. Archer III

Use the following location references to aid in maintenance and servicing the Archer III (refer to Figure 6-4). The fuselage station (Sta), wing station (WS), butt line (BL) and water line (WL) are reference points measured in inches laterally, horizontally or vertically from a given reference line, and show station locations of structural members. Fuselage station 0 is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section. Butt line station 0 is the airplane centerline. WL station 0 is 20.5 inches below cabin floor measured at rear wing spar with airplane level.

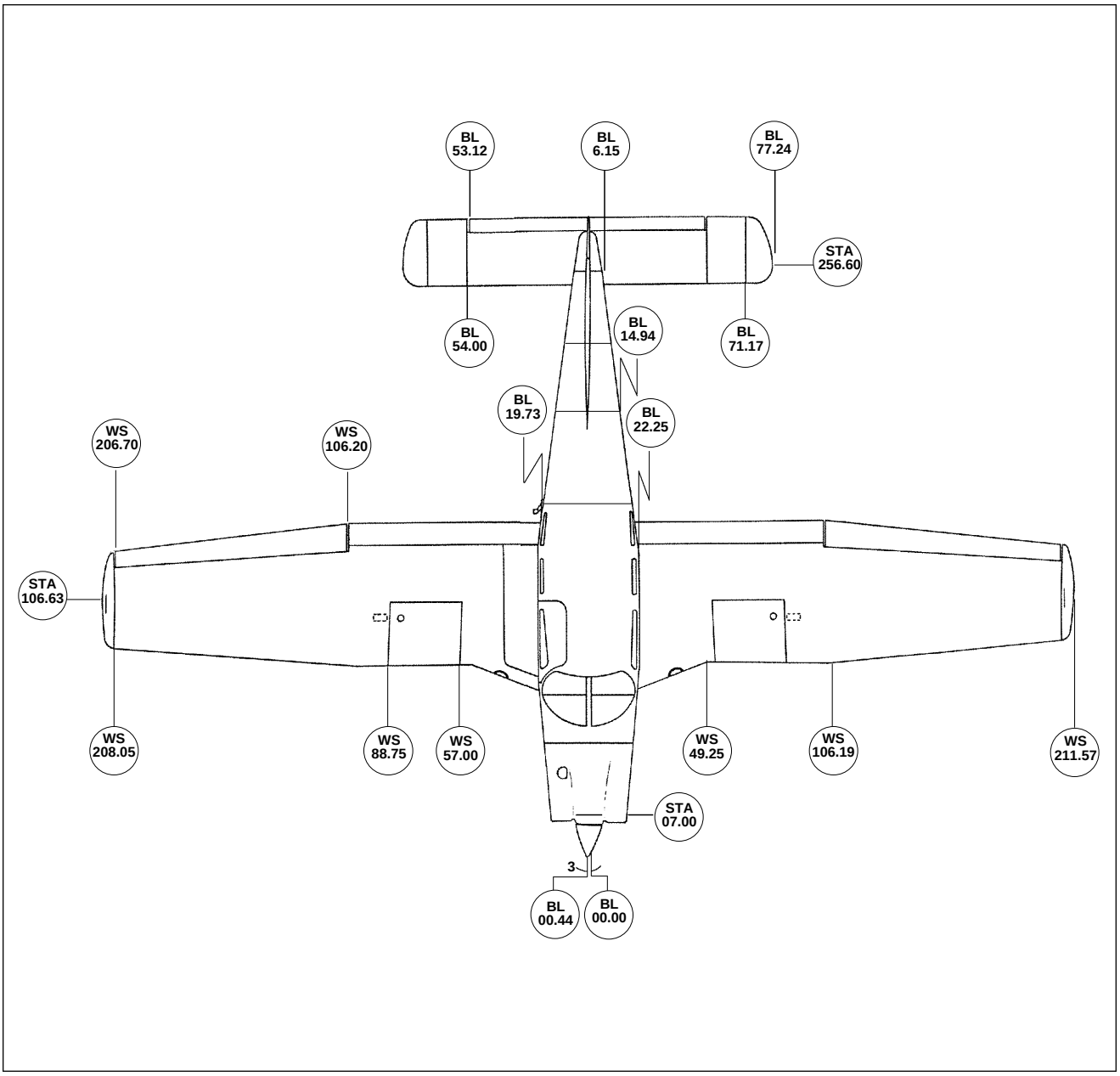


Figure 6-4. Station Reference Lines - Archer III (1 of 2)

STATION REFERENCE LINES (continued)

B. Archer III (continued)

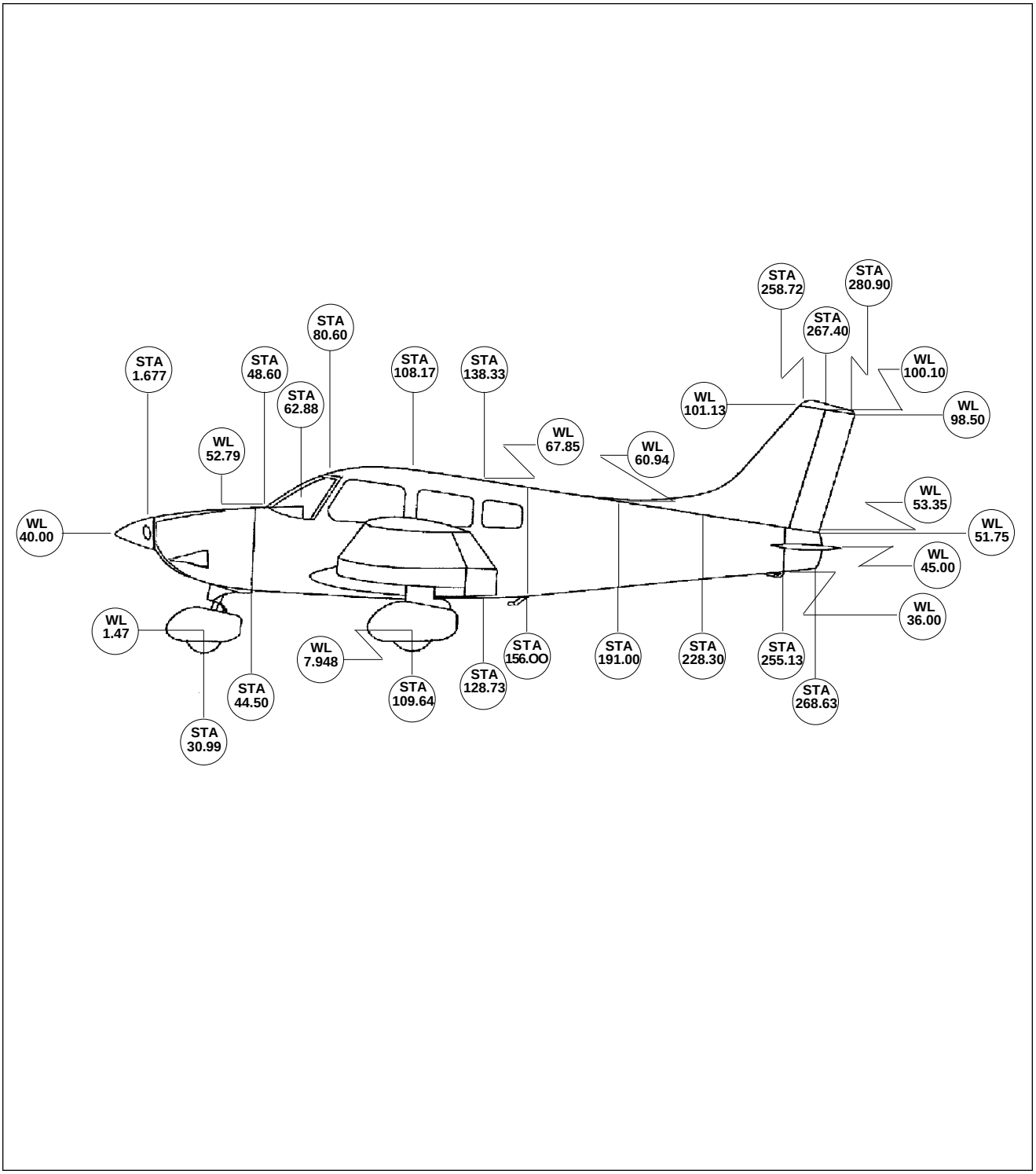
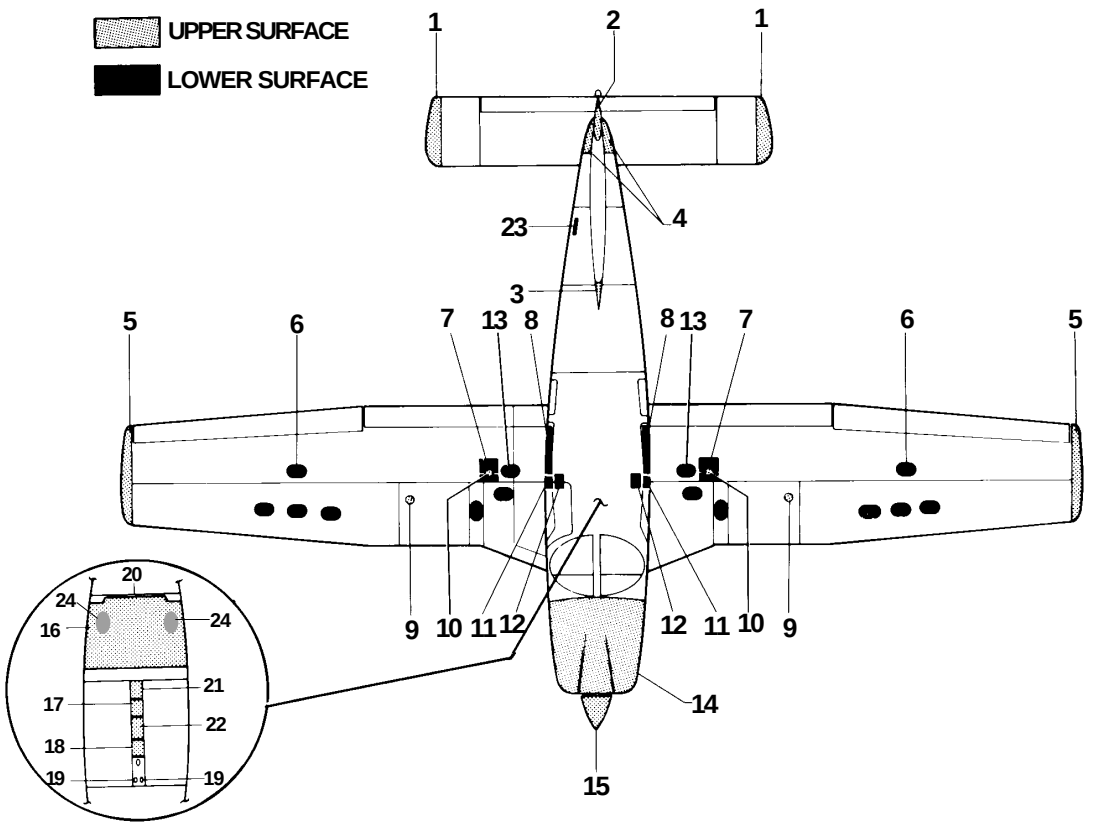


Figure 6-4. Station Reference Lines - Archer III (2 of 2)

ACCESS AND INSPECTION PROVISIONS

Access and inspection provisions for the PA-18-181 are shown in figure 6-3. The component serviced or inspected through each opening is identified in the illustration. All access plates and panels are secured by metal fasteners or screws. To enter aft section of fuselage, open baggage compartment door and remove access panel.



1. STABILATOR TIP
2. RUDDER TIP
3. FIN FAIRING
4. TAIL CONE, CONTROL CABLE AND TRIM SCREW
5. WING TIP
6. BELLCRANK AND CONTROL CABLE COVERS
7. MAIN GEAR STRUT ASSEMBLY FAIRING
8. FLAP TORQUE TUBE AND AILERON CABLES FAIRING
9. FUEL TANK FILLER CAP
10. STRUT FILLER CAP
11. FUEL LINES FAIRING
12. FUEL LINES AND SPAR ATTACHMENT BOLTS COVER.
13. CONTROL CABLES COVER
14. ENGINE COWL ASSEMBLY
15. PROPELLER SPINNER
16. SEAT, BATTERY, TORQUE TUBE AND CONTROL CABLES
17. MIDDLE CONTROL CABLE PLATE
18. FORWARD AILERON AND STABILATOR CONTROL CABLE PLATE
19. AILERON AND STABILATOR CONTROL CABLE COVERS
20. AFT FUSELAGE AREA AND STROBE LIGHT POWER SUPPLY COVER
21. REAR CONTROL CABLES AND PULLEYS COVER
22. FLAP CONTROL COVER
23. EMERGENCY LOCATOR TRANSMITTER
24. CONTROL CABLE INSPECTION PANELS *(AIRPLANES MANUFACTURED BEFORE 1979 MAY NOT HAVE THESE PANELS INSTALLED. REFER TO CHAPTER 51 FOR PROCEDURES TO INSTALL CONTROL CABLE INSPECTION PANELS,)*

Figure 6-5. Access Plates and Panels

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

7

LIFTING AND SHORING

1C4

CHAPTER 7 - LIFTING AND SHORING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
7-10-00	JACKING	1C7	

THIS PAGE INTENTIONALLY LEFT BLANK

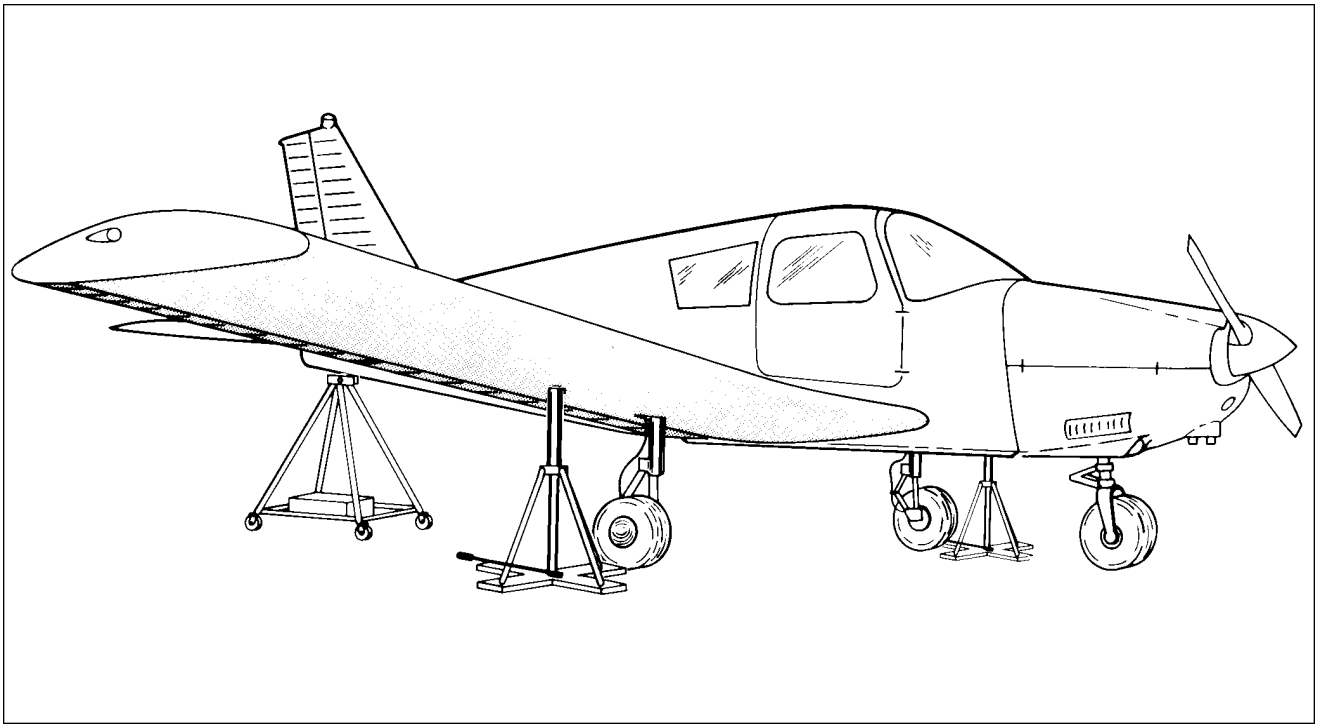


Figure 7-1. Jacking Arrangement

JACKING

Jacking the airplane is necessary to service landing gear and to perform other service operations. Proceed as follows:

1. Place jacks under jack pads on front wing spar. (refer to figure 7-1.)

— WARNING —

Apply sufficient tail support ballast to prevent airplane from tipping forward.

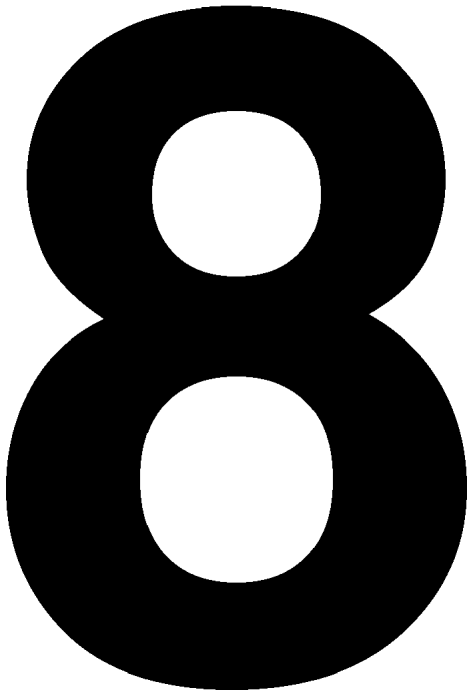
2. Attach tail support to tail skid. Place approximately 250 pounds of ballast on base of tail support to hold down the tail.

3.Raise the jacks until all three wheels are clear of surface.

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER



LEVELING AND WEIGHING

1C9

CHAPTER 8 - LEVELING AND WEIGHING

TABLE OF CONTENTS/EFFECTIVITY

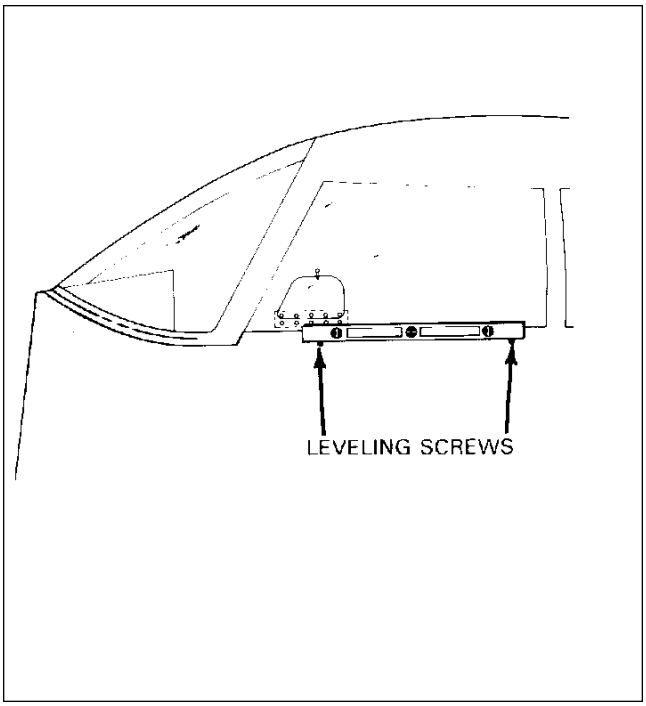
CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
8-10-00	LEVELING	1C11	
8-20-00	WEIGHING	1C12	

LEVELING

All configurations of the airplane have a means for longitudinal and lateral leveling. The airplane may be leveled while on jacks, during the weighing procedure while wheels are on scales, or while wheels are on the ground.

A. Longitudinally level airplane as follows (Refer to Figure 8-1):
   1. Partially withdraw two leveling screws located just below left front side window.
   2. Place level on screws heads and adjust jacks until level is centered
   3. If airplane is on scales or on floor, block main gear oleos to full extension, and deflate nose wheel until proper position is reached.

B. Laterally level airplane as follows (Refer to Figure 8-2):
   1. Place level under rear seat.
   2. Raise or lower one wing tip by deflating appropriate tire on high side of airplane, or adjust either jack until bubble in level is centered.



8-1. Leveling Longitudinally

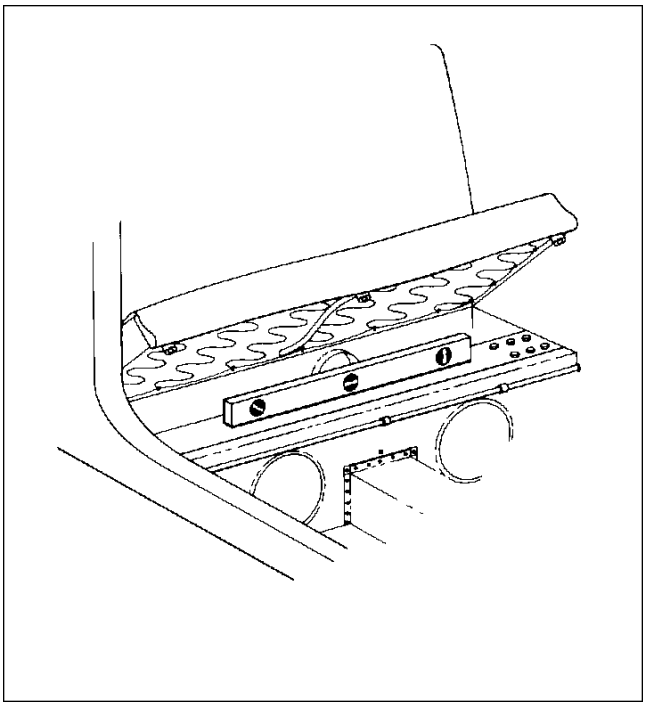


Figure 8-2. Leveling Laterally

WEIGHING (Refer to figure 8-3.)

Weigh airplane as follows:

1. Position a scale and ramp in front of each of the three wheels.
2. Secure scales from rolling forward and tow airplane onto scales.
3. Remove the ramp, being careful not to interfere with scales.
4. If airplane is weighed for weight and balance computations, level airplane per instructions in leveling.

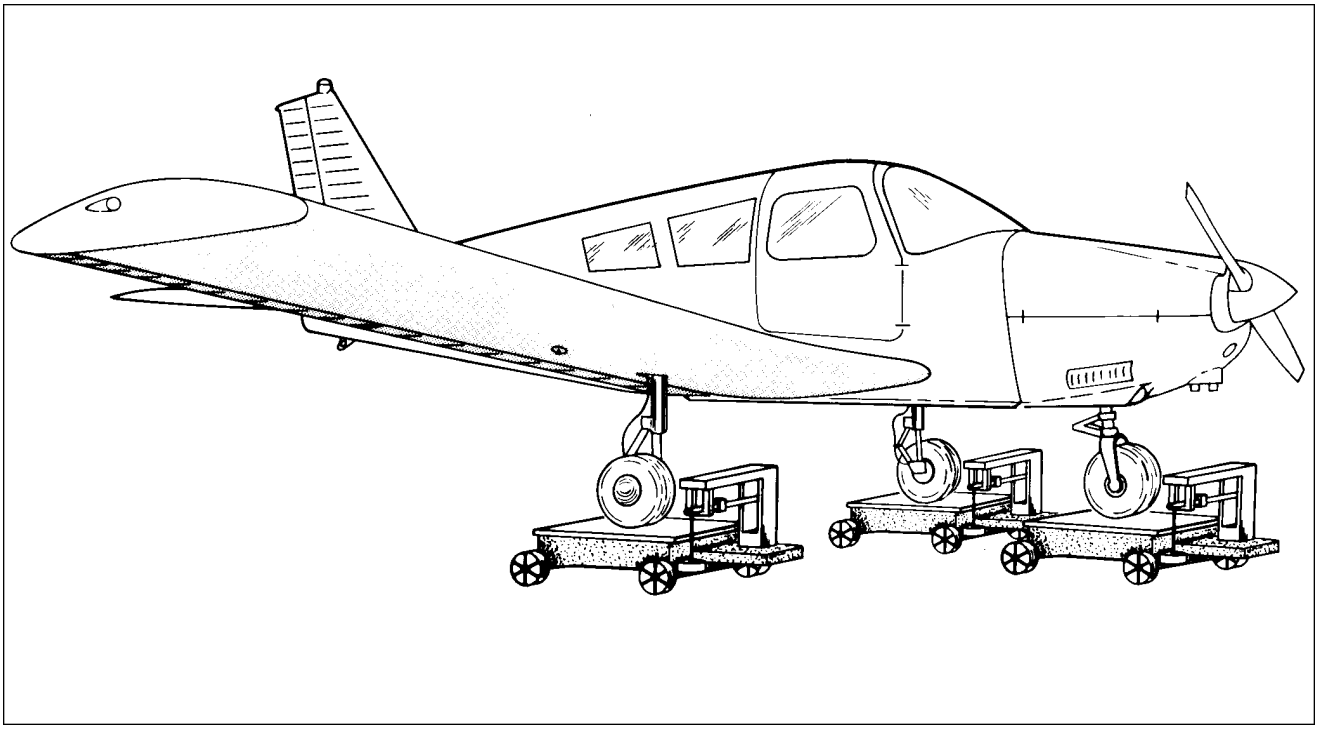


Figure 8-3. Weighing Airplane

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

9

TOWING AND TAXIING

1C14

CHAPTER 9 - TOWING AND TAXIING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
9-10-00	TOWING	1C16	
9-20-00	TAXIING	1C17	

TOWING

— CAUTION —

If towing with power equipment, do not turn nose gear in either direction beyond its steering radius limits. This will damage nose gear and steering mechanism.

— CAUTION —

Do not tow airplane with control locks installed.

— CAUTION —

If moving airplane forward by hand, do not push on trailing edge of control surfaces. Pushing will cause control surface contour to change, resulting in an out-of-trim condition.

Airplane can be towed using the nose wheel steering bar (in baggage area) or by using power equipment that will not damage or cause excess strain to nose gear steering assembly. Towing lugs are part of the nose gear fork.

If using towing lines, attach lines (rope) to both main gear struts as high up on tubes as possible. Lines must be long enough to clear nose and tail by no less than 15 feet. A qualified person must ride in pilot's seat to maintain control by using brakes.

THIS SPACE INTENTIONALLY LEFT BLANK

TAXIING

— CAUTION —

Before taxiing airplane, ground personnel must be checked out by a qualified pilot or other responsible person. All engine starting and shutdown procedures must be covered.

— CAUTION —

Avoid holes and ruts when taxiing on uneven ground.

— CAUTION —

Do not operate engine at high rpm when running up or taxiing over ground with loose stones, gravel, or any loose material that may cause propeller blade damage.

— CAUTION —

Observe wing clearances when taxiing near buildings or stationary objects. Station a guide outside airplane to observe.

Confirm propeller back blast and taxi areas are clear, apply power to start taxi roll, and perform following checks:

1. Taxi forward a few feet, and apply brakes to determine effectiveness.
2. Taxi with propeller set in low pitch rpm setting, where applicable.
3. While taxiing, make slight turns to check steering effectiveness.

— END —

CHAPTER

10

PARKING AND MOORING

1C18

CHAPTER 10 - PARKING AND MOORING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
10-10-00	PARKING	1C20	
10-20-00	MOORING	1C21	

PARKING

— CAUTION —

Ensure aircraft is sufficiently protected against adverse weather conditions and presents no danger to other aircraft.

— CAUTION —

Moor aircraft when parked any length of time or overnight.

— CAUTION —

Be sure to park aircraft into the wind.

— CAUTION —

Use care when setting overheated brakes, or during cold weather when accumulated moisture could freeze brakes.

— CAUTION —

Be sure to lock aileron and stabilator by using front seat belt.

1. Park aircraft into the wind.
2. Set parking brake by pulling back on brake lever and depressing knob on handle.
3. Release parking brake by pulling back on brake lever until catch disengages; then allowing handle to swing forward.
4. Lock aileron and stabilator by using front seat belt.

THIS SPACE INTENTIONALLY LEFT BLANK

MOORING

Aircraft is moored to ensure immovability, protection, and security under various weather conditions.

— CAUTION —

Be sure aircraft is parked into the wind with wheels blocked to ensure aircraft will not move.

— CAUTION —

Use square or bowline knots. Do not use slip knots.

— CAUTION —

Secure tie-down ropes to wing tie-down rings and tail skid at approximately 45 degree angles to ground.

— CAUTION —

Rope of non-synthetic material must have sufficient slack to avoid aircraft damage when ropes contract due to moisture.

— CAUTION —

Lock aileron and stabilator controls using front seat belt or control surface blocks.

— CAUTION —

Install pitot tube cover.

— CAUTION —

Additional high wind preparations include using tie-down ropes from the landing gear forks, and securing rudder.

— END —

CHAPTER

11

REQUIRED PLACARDS

1C22

CHAPTER 11 - REQUIRED PLACARDS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
11-20-00	EXTERNAL PLACARDS AND MARKINGS	1C24	
11-30-00	INTERNAL PLACARDS AND MARKINGS	1D3	
11-30-10	REMOVAL AND INSTALLATION DECALS	1D7	
11-30-10	Paper Decals	1D7	
11-30-00	Vinyl Film Decals	1D7	
11-30-00	Metal Decals	1D7	
11-30-00	Cellophane Backed	1D7	
11-30-00	Paper Backed	1D7	
11-30-00	Metal Decals With No Adhesive	1D7	
11-30-00	Meyercord Decals	1D7	
11-30-10	Removal of Meyercord decals	1D7	
11-30-10	Installation of Meyercord decals	1D8	

EXTERIOR PLACARDS AND MARKINGS

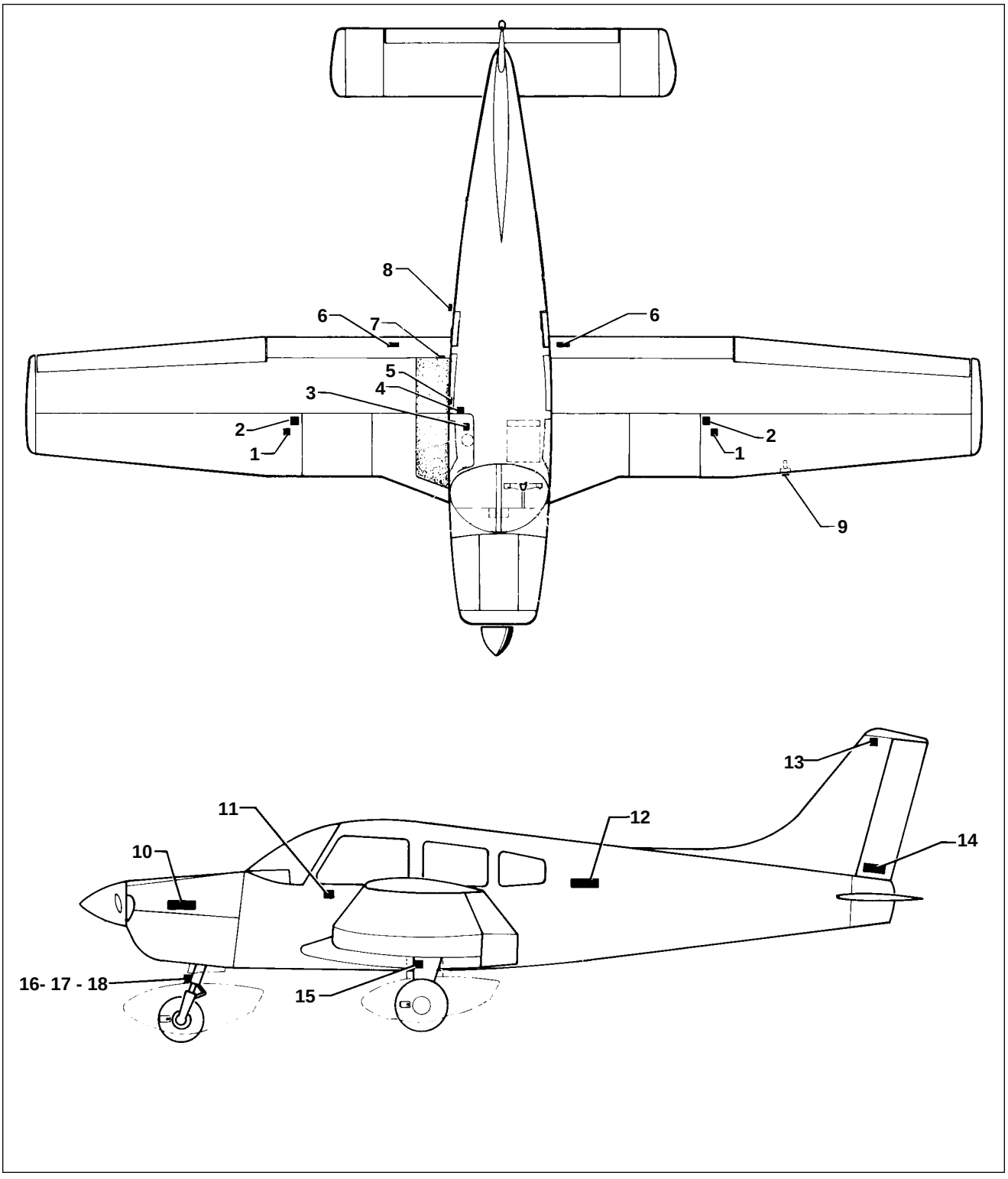


Figure 11-1 External Placards and Markings - Archer II (1 of 2)

EXTERNAL PLACARDS AND MARKINGS (continued)

1. DECAL - FUEL
2. DECAL - AVGAS
3. PLACARD - DOOR RELEASE
4. MEDALLION - PIPER LOGO
5. PLACARD - PIPER AIRE
6. PLACARD - NO STEP
7. PLACARD - FLAP WARNING
8. PLACARD - EXTERNAL POWER
9. DECAL - LIFT DETECTOR
10. NAMEPLATE - CHEROKEE ARCHER I OR ARCHER II
11. PLACARD - LEVEL POINT
12. NAMEPLATE - PIPER OR PIPER ARCHER II
13. DECAL - PIPER
14. PLACARD - DO NOT PUSH
15. DECAL - OLEO SERVICE INSTRUCTION
16. PLACARD - OLEO SERVICE INSTRUCTION
17. PLACARD - TURN LIMIT
18. PLACARD - TURN LIMIT POINTER

Figure 11-1 External Placards and Markings - Archer II (2 of 2)

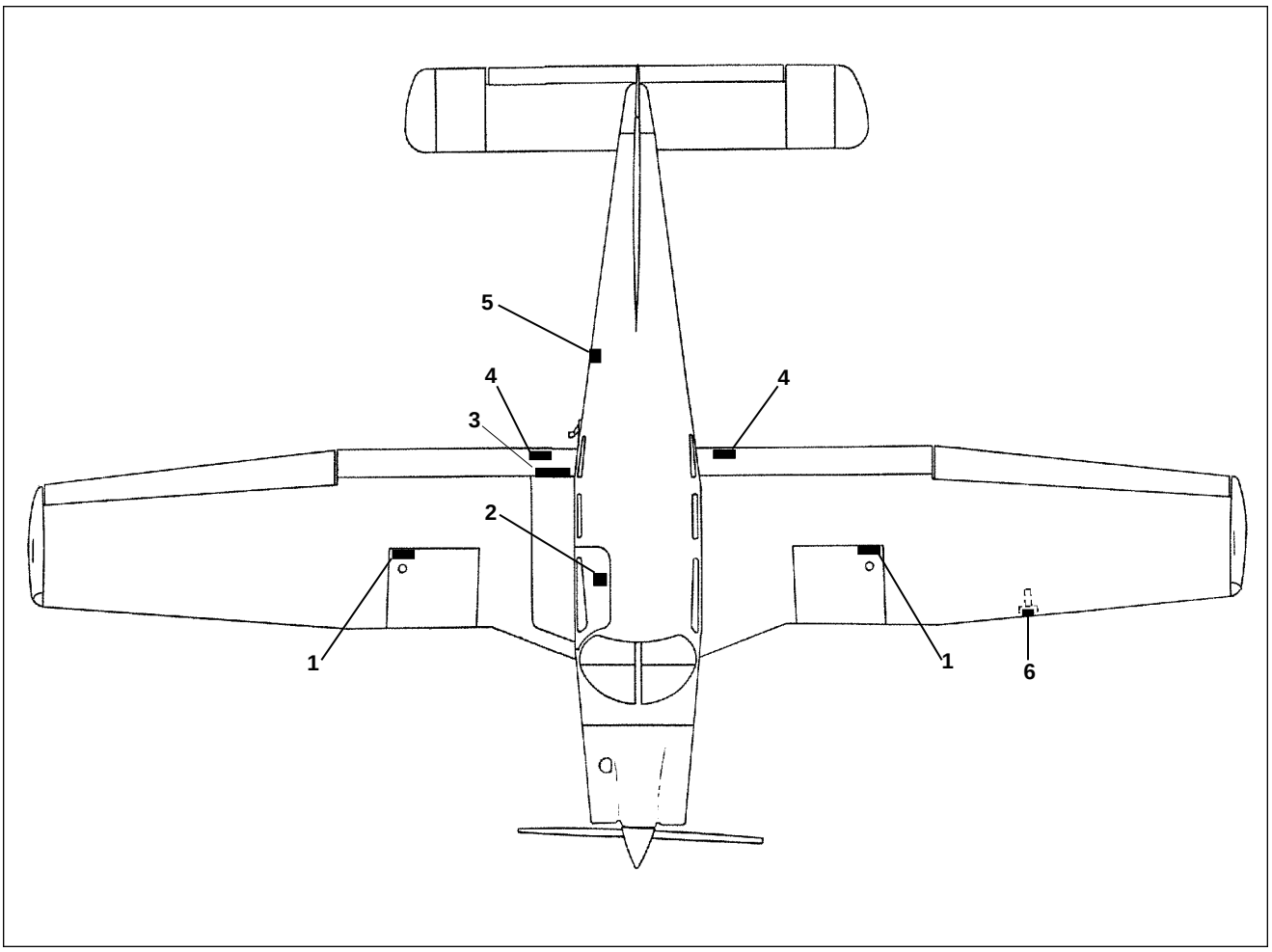


Figure 11-2 External Placards and Markings - Archer III (1 of 2)

EXTERNAL PLACARDS AND MARKINGS (continued)

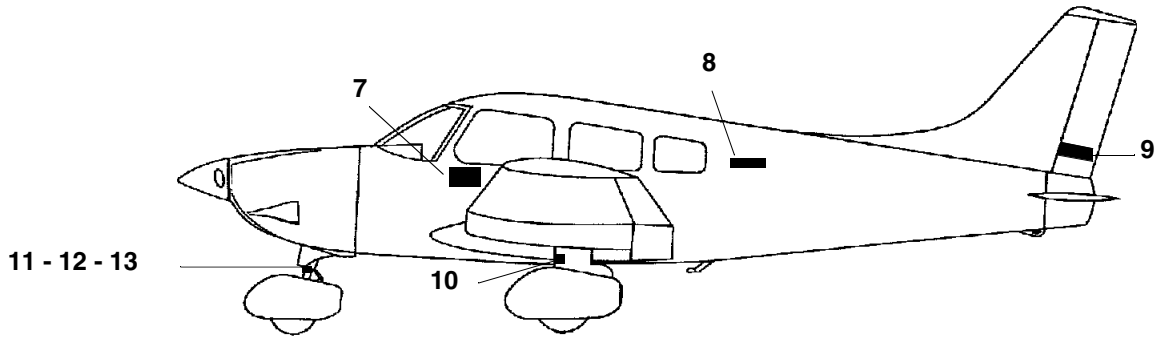


Figure 11-2 External Placards and Markings - Archer III (1 of 2) (continued)

1.	DECAL - AVGAS	8.	DECAL - PIPER LOGO
2.	PLACARD - DOOR RELEASE	9.	PLACARD - DO NOT PUSH
3.	PLACARD - FLAP WARNING	10.	DECAL - OLEO SERVICE INSTRUCTION
4.	PLACARD - NO STEP	11.	PLACARD - OLEO SERVICE INSTRUCTION
5.	PLACARD - EXTERNAL POWER		
6.	DECAL - LIFT DETECTOR	12.	PLACARD - TURN LIMIT
7.	PLACARD - LEVEL POINT	13.	PLACARD - TURN LIMIT POINTER

Figure 11-2 External Placards and Markings - Archer III (2 of 2))

— END —

INTERIOR PLACARDS AND MARKINGS

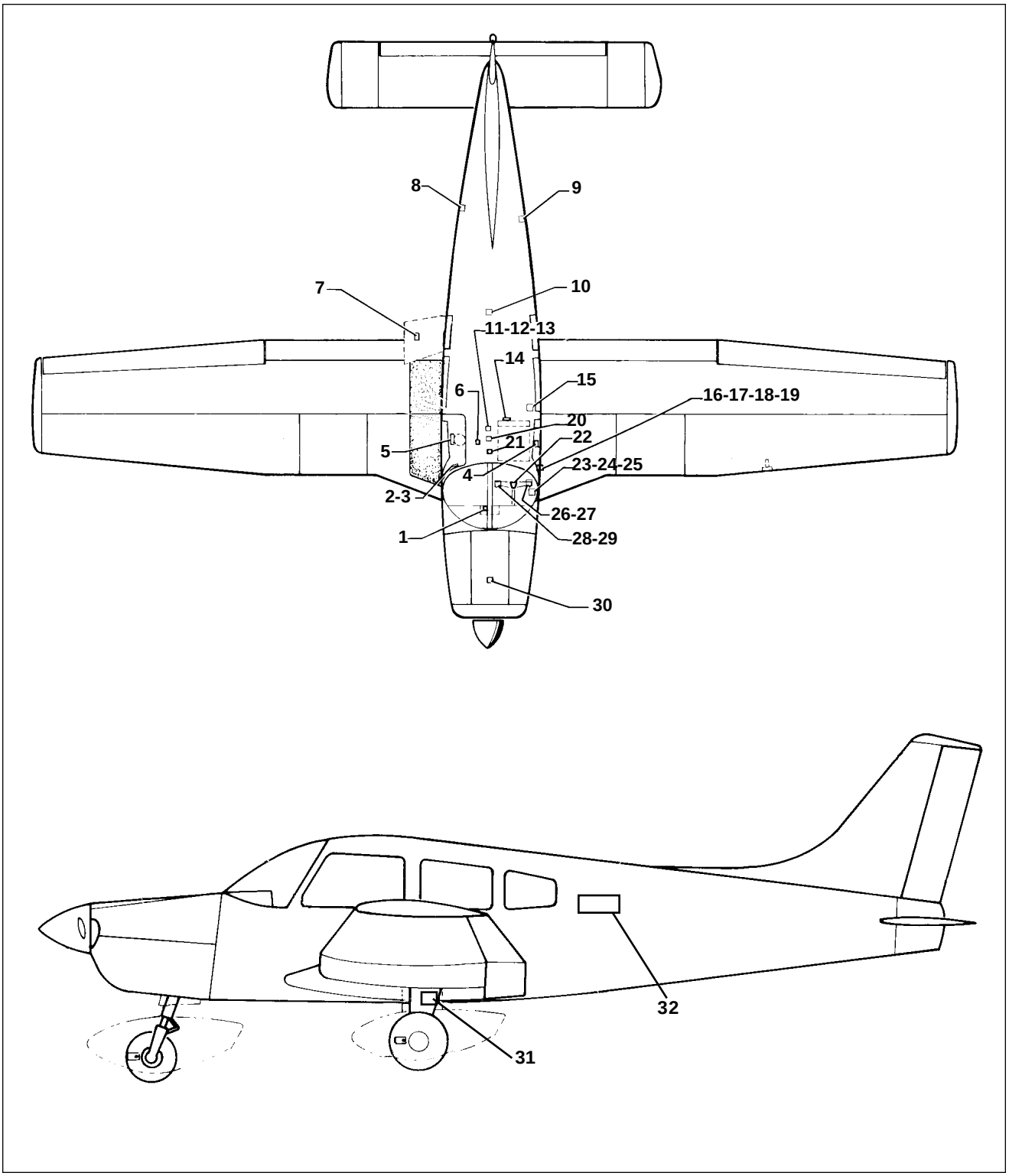


Fig 11-3 Interior Placards and Markings - Archer II (1 of 2)

INTERIOR PLACARDS AND MARKINGS (continued)

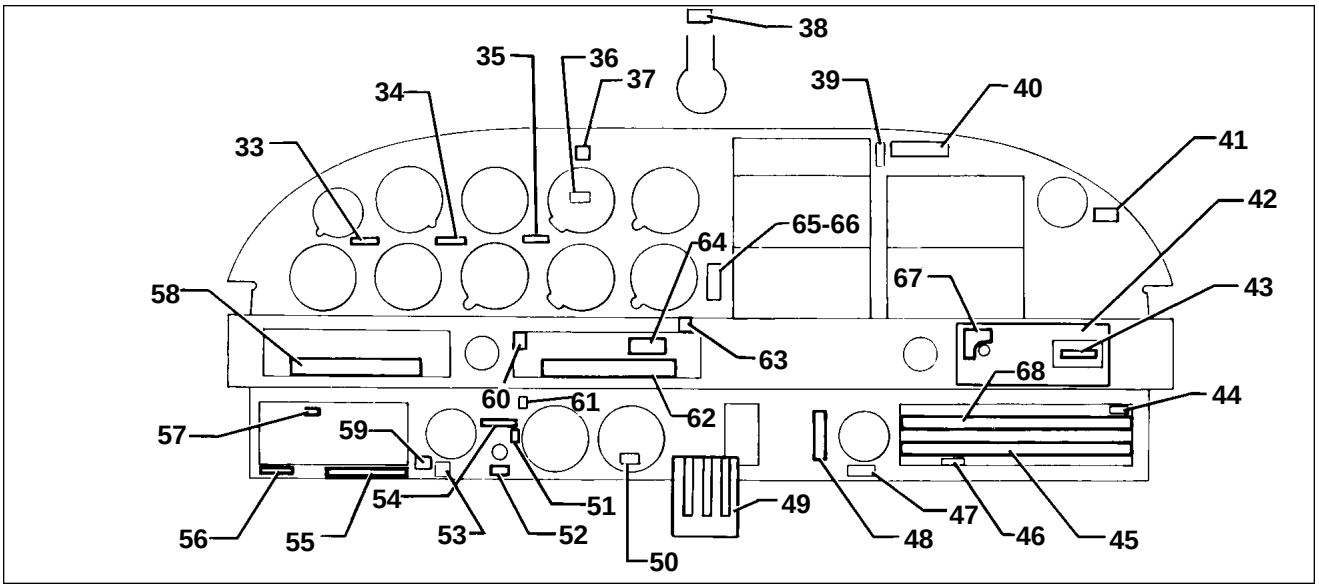


Fig 11-3 Interior Placards and Markings - Archer II (1 of 2) (Continued)

1. PLACARD - RUDDER TRIM
2. PLACARD - OPEN
3. PLACARD - OPEN
4. PLACARD - ELT WARNING
5. PLACARD - DOOR LOCK
6. PLACARD ASSEMBLY - ALTERNATE STATIC CORRELATION
7. PLACARD - MAXIMUM BAGGAGE
8. PLACARD - ELT LOCATION
9. PLACARD - STROBE LIGHT OUTLETS
10. PLACARD - BAGGAGE LIMITATION
11. PLACARD - TRIM INDICATOR
12. PLACARD - TRIM
13. PLACARD - FLAP LEVER
14. PLACARD - SEAT LEG RELEASE
15. PLACARD - PITOT DRAIN
16. PLACARD - FUEL OFF
17. PLACARD - FUEL
18. PLACARD - LEFT TANK
19. PLACARD - RIGHT TANK
20. PLACARD - STABILATOR TRIM
21. PLACARD - DOME LIGHT MAXIMUM
22. MEDALLION - CONTROL WHEEL
23. PLACARD - AIRCRAFT LIMITATIONS MPH OR KNOTS
24. PLACARD - WARNING (EXPOSED OR RECESSED SWITCH
25. PLACARD - WARNING
26. PLACARD - A/P INTERRUPT
27. PLACARD - MIKE
28. PLACARD - ELECTRIC TRIM (CONTROL WHEEL)
29. PLACARD - TRANSPONDER IDENTIFIER
30. PLACARD - OIL SPECIFICATIONS
31. PLACARD - GEAR
32. PLACARD - BAGGAGE COMPARTMENT
33. PLACARD - CROSSWIND COMPONENT, MPH OR KNOTS
34. PLACARD - MANEUVERING SPEED, MPH OR KNOTS
35. PLACARD - EMERGENCY BUS SWITCH
36. PLACARD - ALTITUDE REPORTER INSTALLED
37. PLACARD - ANNUNCIATOR. PRESS TO TEST
38. PLACARD - CAUTION
39. PLACARD - RADIO POWER ON—OFF
40. PLACARD - OIL COOLER WINTERIZATION
42. PLACARD - CAUTION REDUCE AMP LOAD
43. PLACARD - HEATER AND DEFROST
44. PLACARD - COMP[ASS SYSTEM
45. PLACARD - CIRCUIT BREAKER PANEL
46. PLACARD - LANDING AND RECOGNITION LIGHT
47. PLACARD - EMERGENCY BUS SWITCH
48. PLACARD - CARBURETOR AIR
49. PLACARD - ENGINE CONTROLS
50. PLACARD - R.P.M. INSTRUCTIONS
51. PLACARD - ON—OFF
52. PLACARD - MIKE JACK
53. PLACARD - OMNI COUPLER SWITCH
54. PLACARD - PITCH TRIM
55. PLACARD - WARNING
56. PLACARD - MIKE AND PHONE
57. PLACARD - INSTRUMENT LIGHTS (WHT BKGD)
58. PLACARD - TAKEOFF CHECK LIST
59. PLACARD - NAV1 OFF NAV 2
60. PLACARD - INSTRUMENT LIGHTS (BLK BKGD)
61. PLACARD - NAV1 / NAV 2
62. PLACARD - LANDING CHECK LIST MPH OR KNOTS
63. PLACARD - INSTRUMENT LIGHTS (BLK BKGD)
64. PLACARD - FUEL GAUGE WARNING
65. PLACARD - AIR CONDITIONING DOOR OPEN
66. PLACARD - AIR CONDITIONING DOOR
67. PLACARD - VENT FAN
68. PLACARD - CIRCUIT BREAKER PANEL

Fig 11-3 Interior Placards and Markings - Archer II (2 of 2))

INTERIOR PLACARDS AND MARKINGS (continued)

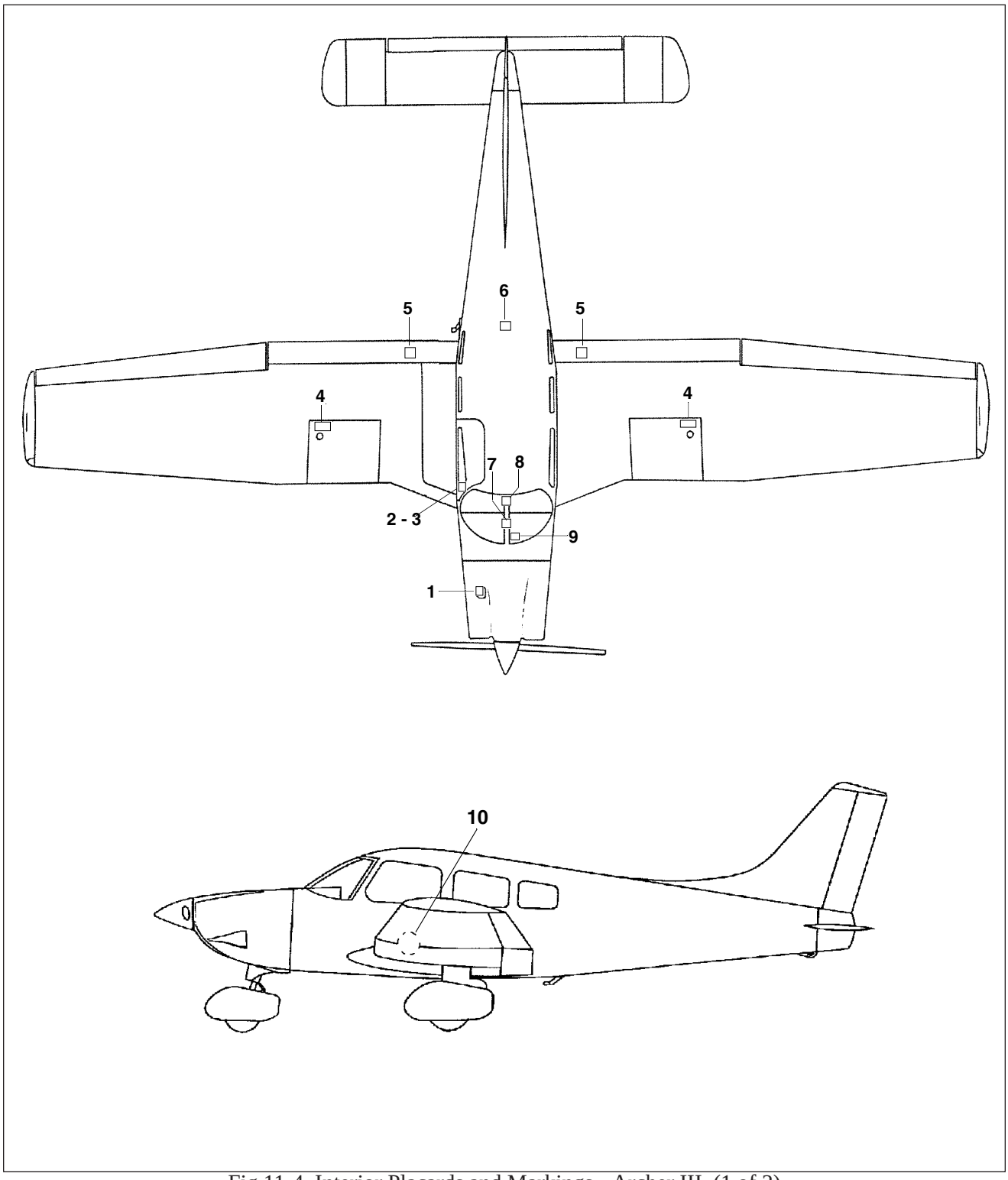


Fig 11-4 Interior Placards and Markings - Archer III (1 of 2)

INTERIOR PLACARDS AND MARKINGS (continued)

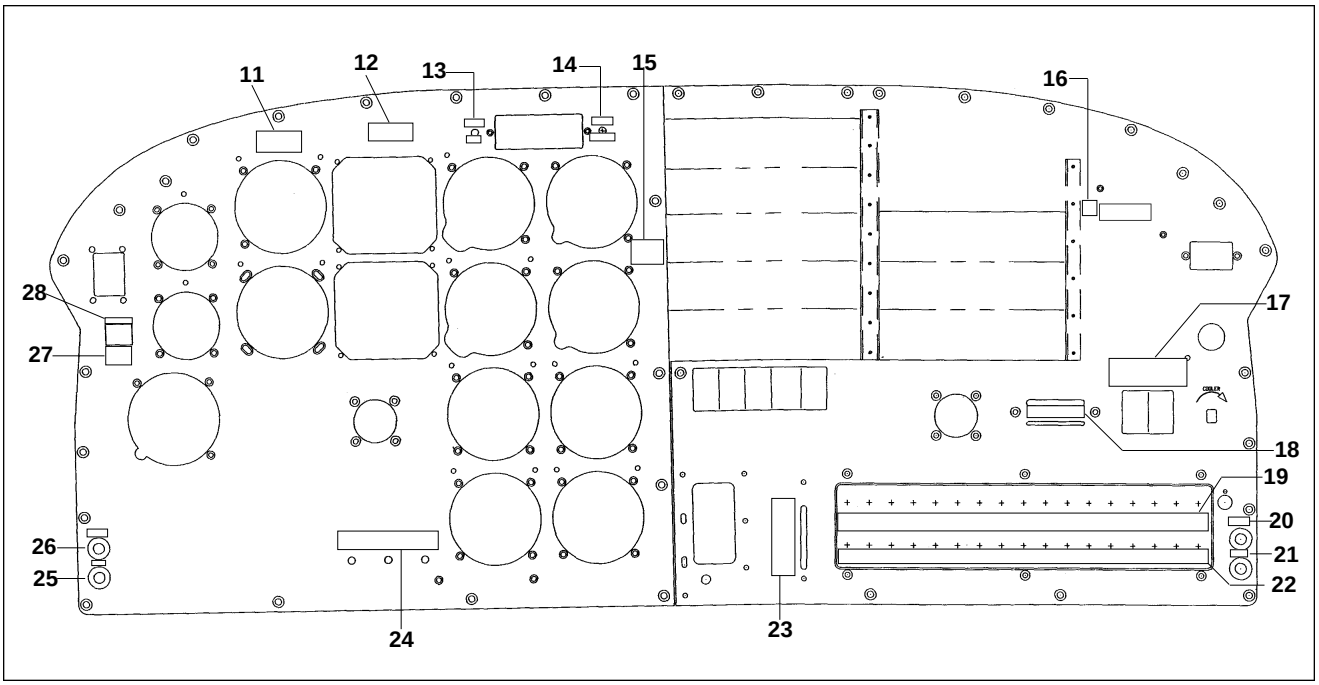


Fig 11-4 Interior Placards and Markings - Archer III (1 of 2) (continued)

1. DECAL - OIL SPECIFICATIONS
2. PLACARD - OPEN
3. PLACARD - LATCH
4. PLACARD - FUEL SPECIFICATIONS
5. DECAL - NO STEP
6. PLACARD - BAGGAGE LIMIT
7. PLACARD - FLAP LEVER
8. PLACARD - COMPASS DEVIATION
9. PLACARD - RUDDER TRIM (1)
10. PLACARD - STABILATOR TRIM (1)
11. PLACARD - AIRSPEED AND CROSS-WIND (1)
12. PLATE - AIRPLANE IDENTIFICATION (1)
13. PLACARD - NIGHT - DAY (1)
14. PLACARD - PRESS-TO-TEST (1)
15. PLACARD - A/P AND ELECTRIC TRIM PREFLIGHT TEST (1)
16. PLACARD - AMP ALTERNATOR (1)
17. PLACARD - A/C WARNING (1)
18. PLACARD - HEATER - DEFROSTER (1)
19. PLACARD - CIRCUIT BREAKER PANEL (1)
20. PLACARD - PHONE (1)
21. PLACARD - MIKE (1)
22. PLACARD - CIRCUIT BREAKER PANEL (1)
23. PLACARD - CARB. HEAT ON-OFF (1)
24. PLACARD - DIMMING (1)
25. PLACARD - MIKE (1)
26. PLACARD - PHONE (1)
27. PLACARD - CAUTION (1)
28. PLACARD - AUX VAC (1)

(1) DENOTES MEYERCORD DECALS OR PLACARDS

Fig 11-4 Interior Placards and Markings - Archer III (2 of 2)

REMOVAL AND INSTALLATION OF DECALS

For proper adhesion of decals, all surfaces must be clean and free of wax, oil, etc. Porous surfaces must be sealed. Sand and clean rough surfaces to remove any residue.

1. Paper Decals - Soak paper decals in water 1 to 3 minutes. Place one decal edge on receiving surface and slide decal off of paper backing. Blot water around decal with a soft absorbent cloth. Remove bubbles trapped beneath decal by wiping carefully towards nearest edge with a cloth. Coat decal with clear varnish to protect from deterioration and peeling. Remove paper decals by rubbing with cloth dampened with lacquer thinner. Use lacquer thinner sparingly if decals are applied over painted or doped surfaces.
2. Vinyl Film Decals - Separate paper backing from vinyl film. Remove paper adhering to film by rubbing with a clean water saturated cloth or a piece of masking tape. Apply cyclohexanone or equivalent, to adhesive side of film. Position and apply decal while adhesive is still tacky. Work a roller across decal until all air bubbles are removed. To remove a vinyl decal, place cloth saturated with cyclohexanone or methyl ethyl ketone on decal. Scrape with micarta scraper. Remove remaining adhesive with cloth dampened with dry cleaning solvent.
3. Metal Decals
   a. Cellophane backed.
      (1) Immerse in water 1 to 3 minutes.
      (2) Remove and dry.
      (3) Remove cellophane backing.
      (4) Position on receiving surface. (For large foil decals, position center or receiving sur- face and work outward from center.)
      (5) Roll with rubber roller and press all edges firmly.
   b. Paper backed.
      (1) Peel backing from decal.
      (2) Apply light coat of cyclohexanone.
      (3) Position and smooth per steps 4 and 5 of cellophane backed decals.
   c. Metal decals with no adhesive.
      (1) Apply cement MIL-A-5092 to decal and receiving surface.
      (2) Allow cement to dry until tacky.
      (3) Apply and smooth down decal.
      (4) Remove excess adhesive with aliphatic naphtha.
   d. To remove metal decals, moisten decal edge with aliphatic naphtha and peel off decal.
4. Meyercord Decals, manufacturered by Mark-It, 1055 Paramount Tarkway, Batavia. IL 60510, are installed on the instrument panel of the Seneca IV. The following procedures should be followed in the event one or more of these decals must be replaced.
   a. Removal of Meyercord Decals

CAUTION

Do not use lacquer thinner on any panel that has been painted with enamel or lacquer. Seneca IV panels are painted at the factory with polyurethane paints.

(1) Remove placard to be replaced with of clean cloth ***dampened*** with lacquer thinner.

CAUTION

Mark-it J-70 solvent will remove enamel, lacquer, and polyutherane based paint products if liquid is dropped onto painted and not removed immediately.

(2). If panel is painted with enamel or lacquer use a clean cloth ***dampened*** with Mark-It J-70 solvent to remove placard to be replaced.

b. Installation of Meyercord Decals
   (1) Brush or wipe a fluid coat of Mark-It C-175 solution on surface to receive decal.
   (2) Mix a solution consisting of 2 parts water and 1 part J-70 solvent.
   (3) Submerge decal in the mixed J-70 solution for approximately 3 to 5 seconds.
   (4) Remove decal from mixed solution and lay in position
   (5) Using a rubber squeegee, squeegee from center to edges to remove excess solution.
   (6) Wait approximately 1 to 1 1/2 minutes, then remove backing paper.
   (7) Using a damp sponge, remove excess solution from face of decal and surrounding area.

— END —

CHAPTER

12

SERVICING

1D9

CHAPTER 12 - SERVICING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
12-00-00	GENERAL	1D11	
12-10-00	REPLENISHING	1D13	
12-11-00	Fuel System	1D13	
12-11-00	Filling Fuel Tanks	1D13	
12-11-00	Anti-Icing Fuel Additive	1D13	
12-11-00	Draining Moisture From Fuel System	1D14	
12-11-00	Draining Fuel System	1D14	
12-12-00	Servicing Oil System	1D15	
12-12-00	Draining Oil Sump	1D15	
12-12-00	Filling Oil Sump	1D15	
12-12-00	Oil Suction Screen	1D15	
12-12-00	Oil Pressure Screen	1D16	
12-12-00	Recommendations for Changing Oil	1D16	
12-12-00	Oil Filter (full flow)	1D17	
12-20-00	SCHEDULED SERVICING	1D19	
12-21-00	Servicing Fuel System	1D20	
12-22-00	Servicing Landing Gear	1D20	
12-22-00	Servicing Oleo Struts	1D20	
12-22-00	Filling Nose Gear Oleo Strut	1D21	
12-22-00	Filling Main Gear Oleo Strut	1D21	
12-22-00	Inflating Oleo Struts	1D23	
12-23-00	Servicing Brake System	1D24	
12-23-00	Filling Brake Cylinder Reservoir	1D24	
12-23-00	Draining Brake System	1D24	
12-24-00	Servicing Tires	1D24	
12-25-00	Servicing Powerplant	1E1	
12-25-00	Remove and Install Induction Air Filter	1E1	
12-25-00	Clean and Inspect Air Filter	1E1	
12-25-00	Servicing Propeller	1E1	
12-26-00	Servicing Electrical System	1E2	
12-26-00	Battery Servicing	1E2	
12-26-00	Battery Box Corrosion Prevention	1E2	
12-27-00	Lubrication Instructions	1E2	
12-27-00	Application of Oil	1E3	
12-27-00	Application of Grease	1E3	
12-28-00	Winterization Plate	1E4	
12-29-00	Lubrication Chart	1E4	

GENERAL

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

This chapter contains routine handling and servicing procedures most often encountered. For other than routine procedures, refer to the applicable section of this manual and the appropriate manufacturer's manual.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

REPLENISHING

A. SERVICING FUEL SYSTEM

1. Filling Fuel Tanks

— WARNING —

Observe all required safety precautions for handling gasoline.

— CAUTION —

Fill tanks with 100 low lead (blue) or 100/130 (green) aviation fuel only, as specified on placard at filler neck.

Fuel tanks of each wing are filled through filler necks located on forward slope of wings. Each wing tank holds 25 U.S. gallons.

2. Anti-icing Fuel Additive

— CAUTION —

Ensure additive is directed into the flowing fuel stream. Additive flow should start after and stop before fuel flow.

— CAUTION —

Do not let concentrated additive directly contact painted sur - faces or interior surfaces of fuel tank.

— CAUTION —

Some fuels have anti-icing fuel additives pre-blended, so no further blending is necessary.

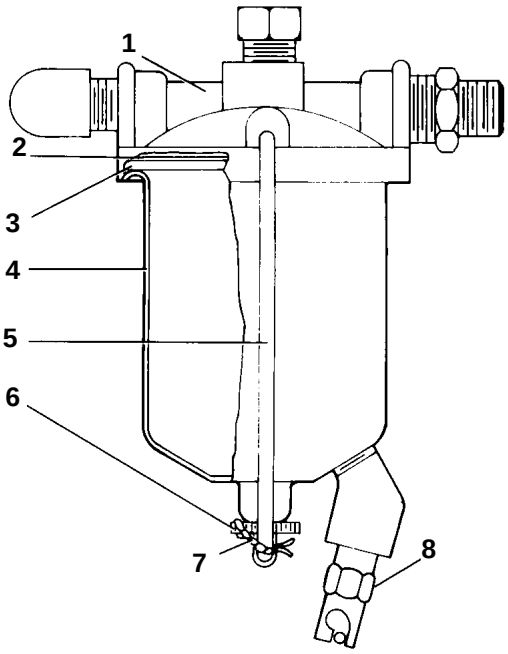
— CAUTION —

Anti-icing fuel additives must not be used as a substitute for preflight draining of fuel system drains.

Use of an anti-icing fuel additive conforming to MIL-L-27686 is permitted.
The additive must:

a. Be uniformly blended with fuel while refueling.
b. Not exceed 15 percent by volume of the refueled quantity.
c. Be blended not less than 10 percent by volume.

One and one-half liquid ounces per ten gallons of fuel falls in this range.
Use blender supplied by additive manufacturer. Use the above information, and carefully follow manufacturer's mixing or blending instructions.



1. BODY
2. SCREEN
3. GASKET
4. STRAINER BOWL
5. BAILWIRE
6. BAIL ASSEMBLY
7. SAFETY WIRE
8. DRAIN VALVE

Figure 12-1. Fuel Filter Bowl and Screen

3. Draining Moisture From Fuel System

— WARNING —

When draining any amount of fuel, be sure no fire hazard exists before starting engine.

Fuel tanks and fuel strainer must be drained daily before first flight and after refueling to avoid accumulation of water or sediment. Each fuel tank has an individual quick drain at lower inboard rear corner of tank. Fuel strainer with a quick drain valve (refer to figure 12-1) is located on lower left side of firewall. Drain fuel tanks and strainer as follows:

a. Drain each tank through an individual quick drain located at lower inboard rear corner of tank. Be sure enough fuel has been drained that all water and sediment is removed.
b. Place a container under fuel strainer drain. Drain fuel strainer by opening quick drain on strainer.
c. Check container for water and sediment. Properly dispose of contents.

4. Draining Fuel System

To drain the fuel system, open valve at inboard end of each fuel tank. Push up on drain valve arms and turn counterclockwise to hold drain in the open position. Flush type drain valve requires drain cup pin to hold valve open. Drain remaining fuel through filter bowl. Any individual tank is drained by closing selector valve and then draining.

B. SERVICING OIL SYSTEM

— CAUTION —

Do not introduce any trade additive to the basic lubricant unless recommended by engine manufacturer.

— NOTE —

Add Avco-Lycoming oil additive P/N LW-16702 every 50 hours or every oil change per instructions in latest revision Lycoming Service Instruction 1014.

Check engine oil level before each flight, and change oil after each 50 hours of engine operation. When changing oil, remove and clean oil screen(s) and replace oil filter cartridge.Intervals between oil changes can be increased as much as 100 percent on engines equipped with full flow (cartridge type) oil filters, if element is replaced each 50 hours of operation. If fuel other than the specified octane rating for the powerplant is used, refer to latest revision Lycoming Service Letter no. L185 for additional information and recommended service procedures. Engine manufacturer does not recommend oil by brand names. Use quality brand aviation grade oil of proper season viscosity. For information on detergent oil use, refer to recommendations for changing oil or latest revision of Lycoming Service Instruction no. 1014.

1. Draining Oil Sump

— CAUTION —

Engine must be warmed to operating temperature to ensure complete draining of old oil.

Drain oil sump as follows:

a. Use proper container with a minimum capacity required to fill sump.
b. Remove engine cowling.
c. Open oil drain valve on underside of engine by pushing arms up and turning counter-clockwise (this will hold drain in open position.

2. Filling Oil Sump

Fill oil sump with oil to the mark on engine dipstick. Find the quantity of oil required for engine in chapter 6. Specified oil grades are found in latest revision of Avco Lycoming Service Instruction no. 1014, the lubrication chart, right cowl panel, and each engine oil filler access door. To service engine with oil, open quick release access door on top of cowling and remove oil filler cap with dipstick.

3. Oil Suction Screen

— CAUTION —

Clean screen every oil change to remove any sludge accumula - tion and examine for metal filings or chips.

— CAUTION —

Examine engine for internal damage if metal particles are found in screen.

a. Remove oil suction screen as follows:
   (1) Cut safety wire.
   (2) Remove hex head plug.
   (3) Clean and inspect screen, place screen inside recess in hex head plug to eliminate possible screen damage.

b. Install oil suction screen as follows:
   (1) Insert screen into housing.
   (2) Verify screen is properly seated.
   (3) Tighten and safety plug with MS-20995-C41 safety wire.

4. Oil Pressure Screen

— CAUTION —

Clean screen at each oil change to remove any sludge accumu - lation and examine for metal filings or chips.

— CAUTION —

Examine for internal engine damage if metal particles are found in oil screen.

— CAUTION —

Use a new gasket when installing screen.

The oil pressure screen is located in a housing on engine accessory case between the magnetos. Verify screen fits flush with base surface of screen housing. Position housing on mounting pad and install attachment bolts. Tighten bolts to a torque of 50 to 70 inch-pounds.

5. Recommendations For Changing Oil

Refer to the latest revision of Lycoming Service Instruction no. 1014 and Lycoming Service Letter no. L185.)

— CAUTION —

Use caution if changing to additive oil on engines that have been operated on straight mineral oil for several hundred hours. The cleaning action of some additive oils loosens sludge deposits and causes plugged oil passages.

— CAUTION —

Do not change to additive or compound oil until after engine overhaul if engine has been operated on straight mineral oil and oil is excessively dirty.

— CAUTION —

Drain straight mineral oil from engine and fill with ashless dispersant oil. Do not add ashless dispersant oil to straight mineral oil.

— CAUTION —

Do not operate engine longer than five hours before first oil change.

a. Check all oil screens for evidence of sludge or plugging.
b. Change oil every ten hours if sludge conditions are evident. Repeat ten hour checks until screen is clean.
c. Change oil at recommended intervals.

6. Oil Filter (Full Flow)

— CAUTION —

Examine for internal damage if material such as chips or particles from bearings are trapped in filter. Evidence of internal engine damage found in the oil filter justifies further examination to determine cause.

a. Replace oil filter after each 50 hours of engine operation. Remove as follows:
   (1) Remove lockwire from bolt head at filter housing end.
   (2) Loosen bolt.
   (3) Remove filter assembly from adapter.
   (4) Before discarding throwaway filter, remove element for inspection. (Use a Champion cutter tool CT-470 available from Champion Spark Plug Co., Toledo, OH 43601.)

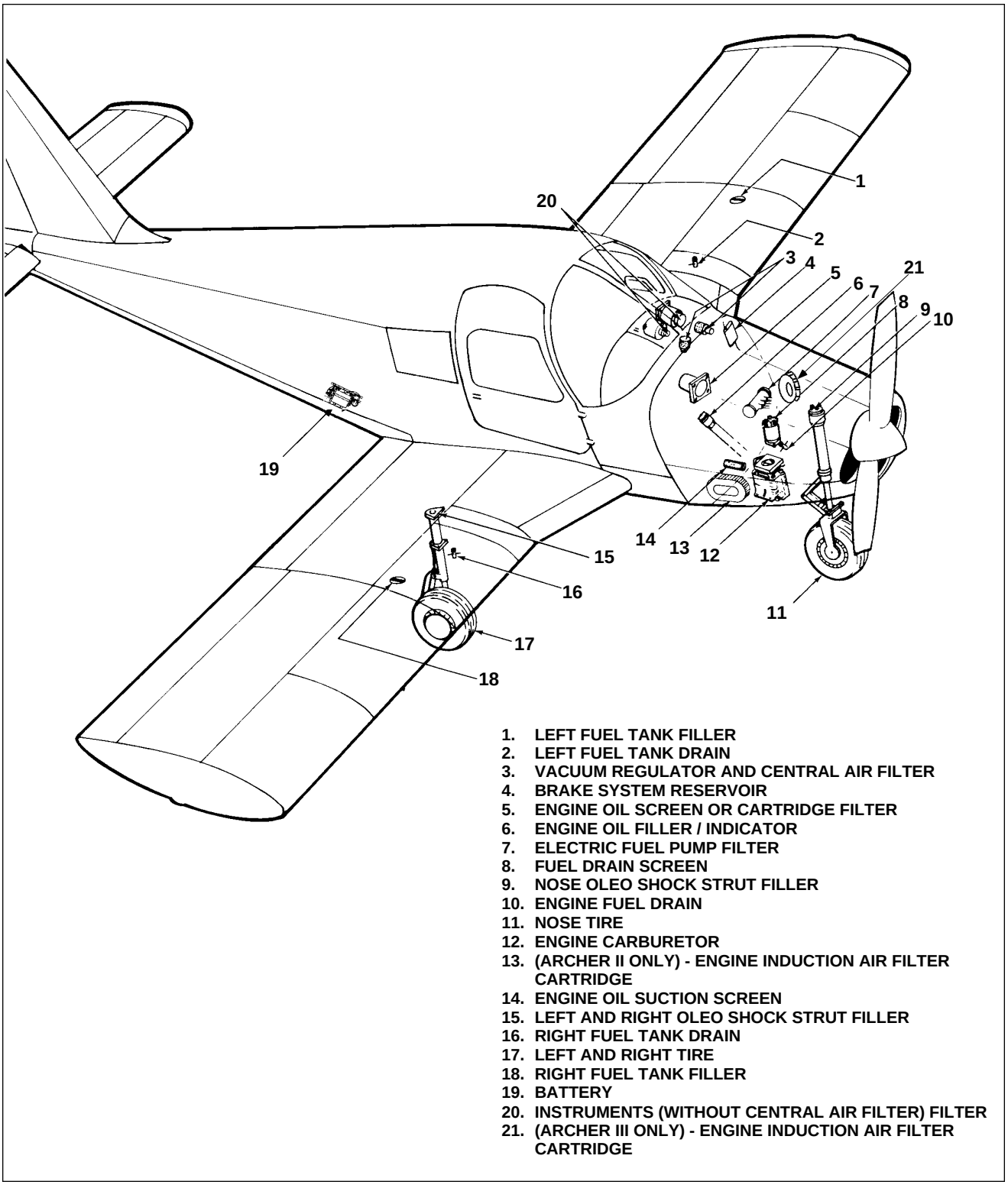
— NOTE —

Small particles of metallic shavings found in new or newly overhauled engines are generally of no consequence, and should not be confused with particles produced by impacting, abrasion, or pressure.

b. Install oil filter as follows:
   (1) Insert filter assembly into place.
   (2) Tighten attaching bolt to a torque of 15 to 18 foot-pounds.
   (3) Lockwire bolt through loops on side of housing to drilled head of thermostatic valve. (Check lockwire is replaced at both attaching bolthead and thermostatic valve. Use MS-20995-C41 safety wire.)

THIS PAGE INTENTIONALLY LEFT BLANK

SCHEDULED SERVICING



1. LEFT FUEL TANK FILLER
2. LEFT FUEL TANK DRAIN
3. VACUUM REGULATOR AND CENTRAL AIR FILTER
4. BRAKE SYSTEM RESERVOIR
5. ENGINE OIL SCREEN OR CARTRIDGE FILTER
6. ENGINE OIL FILLER / INDICATOR
7. ELECTRIC FUEL PUMP FILTER
8. FUEL DRAIN SCREEN
9. NOSE OLEO SHOCK STRUT FILLER
10. ENGINE FUEL DRAIN
11. NOSE TIRE
12. ENGINE CARBURETOR
13. (ARCHER II ONLY) - ENGINE INDUCTION AIR FILTER CARTRIDGE
14. ENGINE OIL SUCTION SCREEN
15. LEFT AND RIGHT OLEO SHOCK STRUT FILLER
16. RIGHT FUEL TANK DRAIN
17. LEFT AND RIGHT TIRE
18. RIGHT FUEL TANK FILLER
19. BATTERY
20. INSTRUMENTS (WITHOUT CENTRAL AIR FILTER) FILTER
21. (ARCHER III ONLY) - ENGINE INDUCTION AIR FILTER CARTRIDGE

Figure 12-2. Servicing Points

A. SERVICING FUEL SYSTEM

1. At intervals of 50 hours or 90 days, whichever comes first, clean:
   a. Fuel strainer screen in fuel bowl, mounted on lower left side of firewall.
   b. Electric fuel pump screen, on lower left side of engine compartment.
   c. Screen in inlet side of carburetor.
2. Flush fuel tanks and selector valve as follows:
   a. Disconnect fuel line at carburetor.
   b. Select a fuel tank.
   c. Turn on electric fuel pump and flush fuel through system until there is no dirt and foreign matter in fuel tank or valve. (Agitation of fuel in tank will help pick up and remove dirt.)
   d. Repeat this procedure for each tank.
   e. Clean all filters when all tanks are flushed.

B. SERVICING LANDING GEAR

The landing gear comprises tires, brakes, oleo strut assemblies, and on some models, wheel fairings. Detailed service and overhaul instructions are in chapter 32.

1. Servicing Oleo Struts

— WARNING —

Do not exceed the tube exposure limits.

— WARNING —

Depress valve core pin until strut chamber pressure diminishes. Do not release air by removing strut valve core or filler plug.

— WARNING —

Clean dirt and particles around filler plugs of landing gear struts before removing plugs. Clean strut tops with compressed air and a dry solvent before removing plugs.

Air-oil struts are in each landing gear oleo to absorb shock from the impact of landing. For proper oleo action, the nose gear oleo strut must have approximately 3.25 0.25 inches of piston tube exposed. Main gear struts require approximately 4.5 0.50 inches tube exposure. Measurements are taken with the airplane on a level surface under normal static load (empty weight of airplane plus full fuel and oil).

If strut has less tube exposed than required, determine whether it needs air or oil as follows:

a. Raise airplane on jacks.
b. With strut extended remove air valve cap at top of housing.
c. Depress valve core to allow air to escape from strut piston until it is fully compressed.
d. Let foam from air-oil mixture settle.
e. Determine if oil is visible up to bottom of filler plug hole.
f. If oil is visible at bottom of hole:
   (1) Check valve for unsatisfactory condition.
   (2) Add air per instructions in inflating oleo struts.

g. If oil is below bottom of hole:
   (1) Check oleo for leaks and other unsatisfactory conditions.
   (2) Add oil per instructions in filling nose gear oleo strut or filling main gear oleo strut.

2. Filling Nose Gear Oleo Strut

Add a proper amount of hydraulic fluid (MIL-H-5606) to nose gear oleo strut and fill as follows:

a. Raise airplane on jacks until nose wheel is completely clear of ground. (Refer to chapter 7.)
b. Place pan under gear to catch spillage.
c. Remove engine cowling and release air from strut housing chamber by removing cap from air valve and depressing valve core.
d. The two methods of strut chamber filling are as follows:
   (1) Method I.
      (a) Remove valve core from filler plug at top of strut housing. Plug is to remain installed.
      (b) Attach one end of a clear plastic hose to valve stem of filler plug and submerge other end into container of hydraulic fluid. Check the end of hose on valve stem is tight and fluid container is approximately equal in height to top of strut housing.
      (c) Fully compress and extend strut, drawing fluid from fluid container and expelling air from strut chamber. Watch fluid pass through plastic hose, until strut is full and there is no air in chamber.
      (d) When air bubbles cease to flow through hose, compress strut fully and remove hose from valve stem.
      (e) With strut fully compressed, remove filler plug. Check fluid level is visible to bottom of filler plug hole.
      (f) Install core in filler plug and apply thread lubricant (Parker #6PB) to filler plug threads. Install plug in top of strut housing. Tighten plug to a torque of 4S foot-pounds.

3. Filling Main Gear Oleo Strut (Refer to Figure 12-3)

A main gear oleo strut partly full or one completely emptied may be filled with MIL-H-5606 fluid as follows:

a. Raise airplane on jacks until landing gear torque link assembly has almost reached its full travel. (Refer to chapter 7.)
b. Place a pan under gear to catch spillage.
c. Remove cap on top of wing to access top of strut housing. Release air from strut housing chamb er by removing cap from air valve and depressing valve core.
d. Remove any one of three torque link bolts, and raise airplane until a minimum ten inches (do not exceed twelve inches tube exposure) of strut tube is exposed with wheel remaining on ground. Fluid will flow from middle chamber to bottom chamber of strut housing, ensuring bottom chamber is filled with fluid.

— NOTE —

Piston tube is free to slide from strut housing when torque links are disconnected.

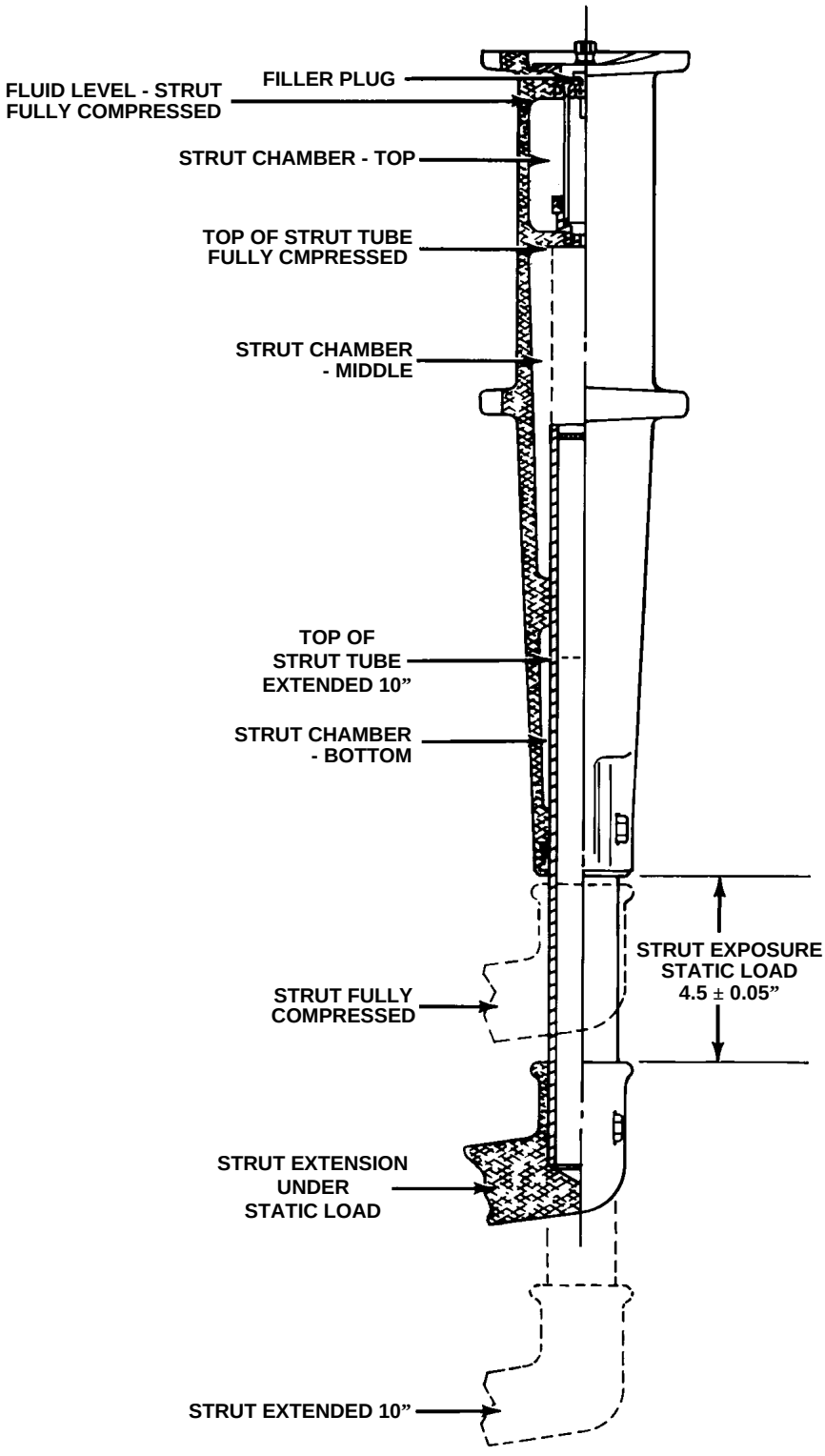

FILLER PLUG
FLUID LEVEL - STRUT FULLY COMPRESSED
STRUT CHAMBER - TOP
TOP OF STRUT TUBE FULLY CMPRESSED
STRUT CHAMBER - MIDDLE
TOP OF STRUT TUBE EXTENDED 10”
STRUT CHAMBER - BOTTOM
STRUT EXPOSURE STATIC LOAD 4.5 ± 0.05”
STRUT FULLY COMPRESSED
STRUT EXTENSION UNDER STATIC LOAD
STRUT EXTENDED 10”

Figure 12-3. Main Gear Oleo Struts (cut-away view)

e. Fill main gear housing by either method as follows:

(1) Method I.

(a) Remove valve core from filler plug at top of strut housing. Allow plug to remain installed.

(b) Attach one end of a clear plastic hose to valve stem of filler plug and submerge other end in a container of hydraulic fluid.

(c) Fully compress and extend (10 inches of strut tube exposed) strut drawing fluid from strut chambers. Watch fluid pass through plastic hose. Stop when strut is full and no air is present in chambers. Strut must be extended to full ten inches to allow fluid to enter bottom chamber of strut housing.

(d) Compress strut fully and remove hose from valve stem when air bubbles cease to flow through hose.

(e) With strut fully compressed, remove filler plug. Check fluid level is visible to bottom of filler plug hole.

(f) Install core in filler plug and apply thread lubricant (Parker 6PB) to threads of filler plug. Install plug in top of strut housing. Tighten plug to a torque of 45 foot-pounds.

(2) Method II.

(a) Remove filler plug from top of strut housing.

(b) Raise strut to full compression.

(c) Pour fluid from a clean container through filler opening until it is visible at top of strut chamber. If housing has been completely emptied or nearly so, allow enough time for fluid to drain through the orifice from upper chamber into middle chamber.

(d) Lower gear until wheel touches the ground (10 inches strut exposure). Fully compress and extend strut three or four times to remove any trapped air, and for fluid to enter bottom chamber of housing.

(e) Raise strut to full compression and fill with fluid to bottom of filler plug.

(f) Apply thread lubricant (Parker 6PB) to filler plug threads. Install filler plug and tighten to a torque of 45 foot-pounds.

f. Replace torque link bolt. Tighten bolt only enough to allow no side play in the connection.

g. With the airplane raised, retract and extend gear strut several times. Check strut actuates freely. The weight of gear fork and wheel should extend strut.

h. Clean fluid overflow and inflate strut per instruction in inflating oleo struts.

i. Check fluid is not leaking around strut piston at bottom of housing.

4. Inflating Oleo Struts

— NOTE —

If possible, use nitrogen instead of air in oleo struts to reduce chances of rust forming inside strut.

Be sure oleo strut has enough fluid. Attach strut pump to air valve and inflate oleo strut. Strut must be inflated until the correct inches of piston is exposed with normal static load (empty weight of airplane plus full fuel and oil) on gears. (Refer to servicing oleo struts.) Rock airplane several times and check gear settles back to proper strut position. Raise airplane and use line pressure from a high pressure air system if strut pump is not available. Lower airplane and rock airplane to let air from valve bring strut down to the proper extension. Check for valve core leakage before capping valve.

C. SERVICING BRAKE SYSTEM

The brake system has a hydraulic fluid reservoir through which the brake system is periodically serviced. Fluid is drawn from reservoir by brake cylinders to maintain proper fluid volume required for maximum braking efficiency. Spongy brake pedal action is an indication brake fluid reservoir is low. Reservoir filling instructions, repair to any brake system components, and instructions to bleed the system are in filling brake cylinder reservoir. (Refer to chapter 32.)

1. Filling Brake Cylinder Reservoir

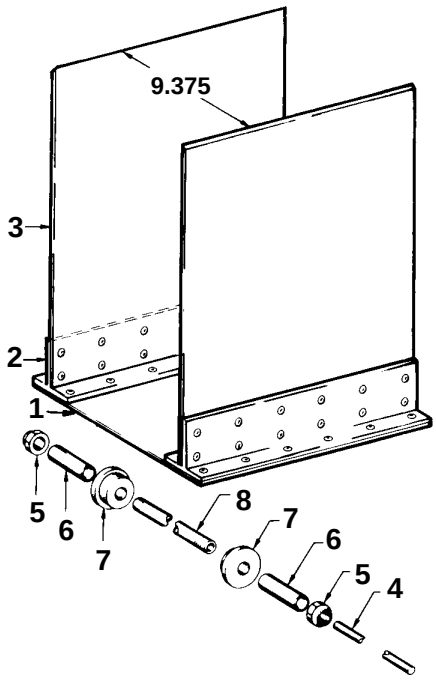
Brake cylinder reservoir must be filled with MIL-H-5606 fluid to level marked on reservoir. The reservoir, (on the left side of firewall in the engine compartment), must be checked every 50-hour inspection and filled as necessary. No adjustment of brakes is necessary. However, brakes should be checked periodically per chapter 32 instructions.

2.Draining Brake System

Connect a hose to bleeder fitting on bottom of cylinder and place other end of line in a suitable container. Open bleeder and slowly pump hand brake lever and desired brake pedal until fluid ceases flow. Flush brake system clean with denatured alcohol.

D. SERVICING TIRES

Tires must be maintained at pressure specified in chapter 6. Examine tires for wear, cuts, bruises, and slippage on the wheel. Tire, tube, and wheel must be properly balanced when installed. Align tire index mark with tube index mark. Make a tire balancer per instructions in Figure 12-4.



USE THE FOLLOWING LIST OF MATERIALS TO MAKE THE BALANCER

- 1. 1 EA BASE	12 X 11	0.190 2024 T3 CLAD ALUMINUM ALLOY
- 2. 2 EA TEE	2.5 X 2 X 11	0.190 2024 T4 EXTRUDED ALUMINUM ALLOY
- 3. 2 EA SIDES	14 X 11	0128 2024 T3 CLAD ALUMINUM ALLOY
- 4. 2 EA AXLE	0.125 X 10.25	4130 STEEL, NOMALIZED
- 5. 2 EA NUTS	AN 365-624	
- 6. 2 EA SPACER	0.50 X 2.25	5052-0 ALUMINUM TUBING
2 EA SPACER	0.50 X 1.25	5052-0 ALUMINUM TUBING
- 7. 2 EA BUSHING	1.480 X 1.625 X 1.00	PHENOLIC OR ALUMINUM
2 EA BUSHING	2.240 X 1.37 X 1.00	PHENOLIC OR ALUMINUM
- 8. 1 EA PIPE	1/8 X 9.3	BLACK STEEL PIPE
* 2 EA BEARINGS	SAVE TWO OF EACH SIZE WORN WHEEL BEARINGS FROM PREVIOUS INSPECTIONS.	

Figure 12-4. Tire Balancer Fixture

1. Chamfer top edges of -3 sides, leaving 1/16 inch flat on top inboard edge. Rivet -2 tee's to -3 sides using AN 470-AD5 rivets 2 spacing. Use AN 426-AD5 rivets 2 center to center to secure -2 tee's to -1 base. If tee extrusion is unavailable, heavy angle extrusion can be used. -3 sides must be vertical.
2. The -4 axle must slide through the -8 pipe. The -5 nuts are made by reaming the existing threads in the AN 365-624 nuts with an R drill, then tapping with a 1/8-27 pipe tap.
3. The -6 spacers are made from 1/2 inch aluminum tubing. The two lengths of spacers are suitable for balancing most any aircraft wheel.
4. The -7 bushings may be made from one inch phenolic or aluminum using a 1-1/2 inch hole saw to cut out smaller bushing and a 1-3/4 inch hole saw to cut out the larger. By inserting a 1/4 inch long threaded bolt through pilot hole and securing with a washer and nut, a drill press and file may be used to make the off- set on the bushing. The turned-down part should just slide inside bearing race. Ream pilot hole to slide over the -8 pipe threads.
5. The -8 pipe is made from a piece of 1/8 inch black pipe and threaded with a 1/8-27 pipe die. Thread 3 inches in from each end of pipe.

E. SERVICING POWERPLANT

Check engine compartment regularly for oil and fuel leaks, chafing of lines, loose wires, and proper tightness of all parts. Maintenance instructions for powerplant are in chapter 71 of this manual and in the appropriate manufacturer's manual.

F. REMOVAL AND INSTALLATION OF INDUCTION AIR FILTER

1. Archer II

a. The air filter is located on right side and midway in the engine compartment. Remove as follows:
   (1) Remove the two nuts and washers on cover assembly and pull off cover.
   (2) Remove and clean air filter.
b. Install air filter as follows:
   (1) Install air filter.
   (2) Install cover and install and tighten cover assembly nuts and washers**.**

2. Archer III

a. The air filter is located on the left side and midway in the engine compartment. Remove as follows:
   (1) Remove lower engine cowling
   (2) Remove 6 screws that retain filter cover. Remove cover.
   (2) Remove the 2 wing nuts and washers securing the retaining plate located on lower left engine section.
   (3) Remove and clean air filter.
b. Install air filter as follows:
   (1) Position air filter on engine.
   (2) Install retaining plate and secure with the two washers and wing nuts.
   (3) Install cover and secure with 6 retaining screws.
   (4) Install engine cowling.

G. CLEANING AND INSPECTION OF AIR FILTER

— CAUTION —

If cleaning filter element by rapping on hard flat surface, be careful not to damage or crease the sealing ends.

— CAUTION —

Do not wash filter element in any liquid or soak in oil. Do not blow off dirt with compressed air.

Air filter must be removed and cleaned daily when operating in dusty conditions. If any holes or tears are noticed, air filter must be replaced immediately (refer to PA-28-181 Parts Catalog). Clean filter element by shaking off loose dirt by rapping filter element on a hard flat surface.

Clean air filter housing by wiping with a clean cloth soaked in a suitable quick drying type solvent. Install and seal filter element when housing dries.

H. SERVICING PROPELLER

Propeller surfaces and the spinner and back plate must be cleaned and inspected frequently for nicks, scratches, corrosion, and cracks. Minor nicks and scratches on propeller must be removed per chapter 61 instructions. Each propeller blade face must be painted when necessary (use a flat black paint to retard glare). Wipe surfaces with a light oil or wax, to prevent corrosion.

I. SERVICING ELECTRICAL SYSTEM

Servicing the electrical system involves:

1. Adding distilled water to battery to maintain proper electrolyte level.
2. Checking cable connections for spilled electrolyte that will lead to corrosion.
3. Checking all electrical connections, lights, generator or alternator, and starter for security and operation.
4. Checking all electrical wires for chafing or exposure.

Refer to chapter 24 for more information on the electrical system.

J. BATTERY SERVICING

1. Archer II

a. Battery Box Corrosion Prevention

The battery must be checked for spilled electrolyte or corrosion each 50 hour inspection or every 30 days, whichever comes first. If corrosion is found in box, on terminals, or around battery, remove and clean box and battery as follows:

(1) Remove box drain cap from underside of fuselage and drain off any electrolyte overflow in box. (Serial numbers 28-8690048 to 28-8690056 and serial numbers 2890001 and up do not have a drain cap.)

Island Enterprises

— CAUTION —

Do not allow soda solution to enter battery.

(2) Clean battery and box. Corrosion effects are neutralized by applying a solution of baking soda and water mixed to consistency of thin cream. Application of this mixture must be applied until all bubbling action has ceased.
(3) Rinse battery and box with clean water, and dry.
(d) Place cap over battery box drain. (Serial numbers 28-8690048 to 28-8690056 and serial numbers 2890001 and up do not have a drain cap.)
(e) Install battery. (Refer to chapter 24 for additional service information.)
(f) Check electrolyte level. Add distilled water as necessary.

2. Archer III (S/N's 2890206 and up)

a. Battery Corrosion Prevention

The battery must be checked for corrosion each 50 hour inspection or every 30 days, whichever comes first. If corrosion is on battery or terminals clean battery and terminals per procedures in chapter 24, section 24-30-00. paragraph E, 2, c.

b. Check and service acid recovery (vent) jar and related hoses every 50 hours or following extensive battery use, such as a hard start requiring repeated use of starter. Refer to Chapter 24, section 24-30-30, paragraph E, 2, d.
c. Check electrolyte level. Add distilled water as necessary.

K. LUBRICATION INSTRUCTIONS

Proper lubrication procedures prolong airplane service life and reduce the frequency of extensive repairs. Periodic application of recommended lubricants to bearing surfaces will ensure maximum efficiency and utmost service of all moving parts. Lubrication instructions regarding locations, time intervals, and type of lubricants are in the lubrication chart.

— CAUTION —

Replace components to be lubricated if evidence of excessive wear is found.

— CAUTION —

Remove excess lubricants from components. Proper cleaning will prevent the collection of dirt and sand in abrasive quantities and will reduce excessive wear or damage to bearing surfaces.

— CAUTION —

Use recommended lubricants. If general purpose lubricating oil is specified, but unavailable, clean engine oil may be used.

1. Application of Oil

When specific lubrication instructions are not available, observe the following precautions:

— CAUTION —

Be careful not to add too much oil. Excess oil will be thrown off during operation and cause pitting and burning of the magneto points.

Squeeze magneto cam follower felts at regular inspection periods. If oil appears on fingers, do not add oil. If felt is dry, moisten with light oil.

— CAUTION —

Control cables are coated by the manufacturer, additional protection for corrosion prevention is unnecessary.

— CAUTION —

Apply oil sparingly, never more than enough to coat bearing surfaces.

2. Application of Grease

— CAUTION —

Fill grease gun with new, clean grease of the grade specified.

— CAUTION —

If reservoir is not provided around bearing, apply lubricant sparingly. Wipe off any excess.

— CAUTION —

Remove wheel bearings from wheel hub and clean thoroughly with proper solvent. When repacking with grease, check lubricant enters the space between rollers in retainer ring. Do not pack grease into wheel hub.

L. WINTERIZATION PLATE

— CAUTION —

Install engine breather tube winterization plate Kit No. 763828 for extreme cold weather engine operation. Install plate on inlet opening of oil cooler plenum chamber, if ambient temper - ature is 50°F or less.

— NOTE —

Stow unused plate on bracket located on oil cooler plenum chamber.

M. LUBRICATION CHART

Each part to be lubricated on the lubrication chart, is noted by a frequency symbol showing time intervals between lubrications. Application symbols with frequency symbols show how lubrication is applied. A parts nomenclature key, noted by a number adjacent to the frequency symbol, identifies the part to be lubricated. Within the frequency symbol is a code letter identifying lubricant type used. A special instructions number gives instruction for lubricating a particular component.

— CAUTION —

Lubricate engine fittings only with fluid contained in the particular lines.

— CAUTION —

Do not use hydraulic fluid with castor oil or ester base.

— CAUTION —

Do not overlubricate cockpit controls.

— CAUTION —

Do not apply lubricant to rubber parts.

— CAUTION —

Do not lubricate cables. (Slippage will result.)

CHART 1201. THREAD LUBRICANTS

TYPE OF LINE	TYPE OF LUBRICANT
Brakes	MIL-H-5606
Freon Refrigerant	TT-A-580 or MIL-T-5544, Anti-Seize Compound
HFC-134a Refrigerant	MIL-T-5544, Anti-Seize Compound ***(See Caution Below)***
Fuel	MIL-T-5544, Anti-seize, Graphite Petrolatum
Landing Gear Air Valve	6PB Parker
Oil	MIL-G-6032, Lubricating Grease (Gasoline and Oil Resistant)
Pitot and Static	TT--580 (JAN-A-669),Anti-Seize Compound (White Lead Base)

— CAUTION —

Do not permit MIL-T-5544 anti-seize compound to enter air conditioning lines or system. Apply to fitting threads only.

SPECIAL INSTRUCTIONS

1. Clean exterior of bearings and bushings with dry type solvent before lubricating.
2. Wipe all lubrication points clean of old grease, oil, dirt, etc, before lubricating.
3. See latest revision of Lycoming Service Instructions no. 1014 for detergent oil use.

THIS SPACE INTENTIONALLY LEFT BLANK

CHART 1202. TYPE OF LUBRICANTS

LUBRICANT	SPECIFICATION	PREFERRED PRODUCT AND VENDOR
LUBRICATING OIL, GENERAL PURPOSE, LOW TEMPERATURE	MIL-L-78670	
LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED IN THE LATEST REVISION OF TEXTRON LYCOMING SERVICE INSTRUCTION NO. 1014	MIL-L-6082	
HYDRAULIC FLUID PETROLEUM BASED	MIL-H-5606	
GREASE, AIRDRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW	MIL-G-23827	
GREASE, AIRCRAFT HIGH TEMPERATURE		TEXACO MARFAK ALL PURPOSE GREASE. MOBILE GREASE 77 (OR MOBILUX EP2) SHELL ALVANIA EP GREASE 2
PARKER O-RING LUBRICANT		
CARBON DIOXIDE RELEASE DRY AGENT LURICANT	MS-122N/CO_2	MILLER-STEPHENSON CHEMICAL, DANBURY, CN 06810
GREASE - LUBRICATION, GENERAL PURPSE, AIRCRAFT	MIL-G-7711	
SILICONE, COMPOUND	MIL-C-21567	
GREASE, AIRCRAFT WIDE-TEMPERATURE	MIL-G-81322	MOBIL GREASE 28 AEROSHELL GREASE 22 ROYCO 22S
GREASE, HIGG AND LOW TEMPERATURE		LUBRIPLATE 907 FISKE BROS. REFINING CO.

REFERENCE CHART 9105

THIS PAGE INTENTIONALLY LEFT BLANK

COMPONENT	LUBRICANT	FREQUENCY
1. OLEO STRUT FILLER POINT	MIL-H-5606	AS REQUIRED
2. UPPER TORQUE LINK BEARING	MIL-G-23827	100 HRS
3 TORQUE LINK BUSHING	MIL-L-7870	100 HRS
4. TORQUE LINK CONNECTING BUSHING	MIL-G-23827	100 HRS
5. MAIN WHEEL BEARING	TEXACO MARFAX ALL PURPOSE GREASE OR MOBIL GREASE 77 OR MOBILE EP2 GREASE OR SHELL ALVANIA EP GREASE	2100 HRS
6. EXPOSED OLEO STRUT	CARBON DIOXIDE RELEASE AGENT DRY LUBRICANT MS-122N/CO_2	100 HRS
7. BRAKE RESERVOIR	MIL-H-5606	100 HRS

SPECIAL INSTRUCTIONS

1. Main Wheel Bearings - Disassemble and clean with a dry type solvent. Ascertain that grease is packed between the roller and cone. Do not pack grease in wheel housing. Wheel bearings require cleaning and repacking after exposure to an abnormal quantity of water.
2. Oleo Struts and Brake Reservoir - Fill per instructions on unit or container or refer to service manual.

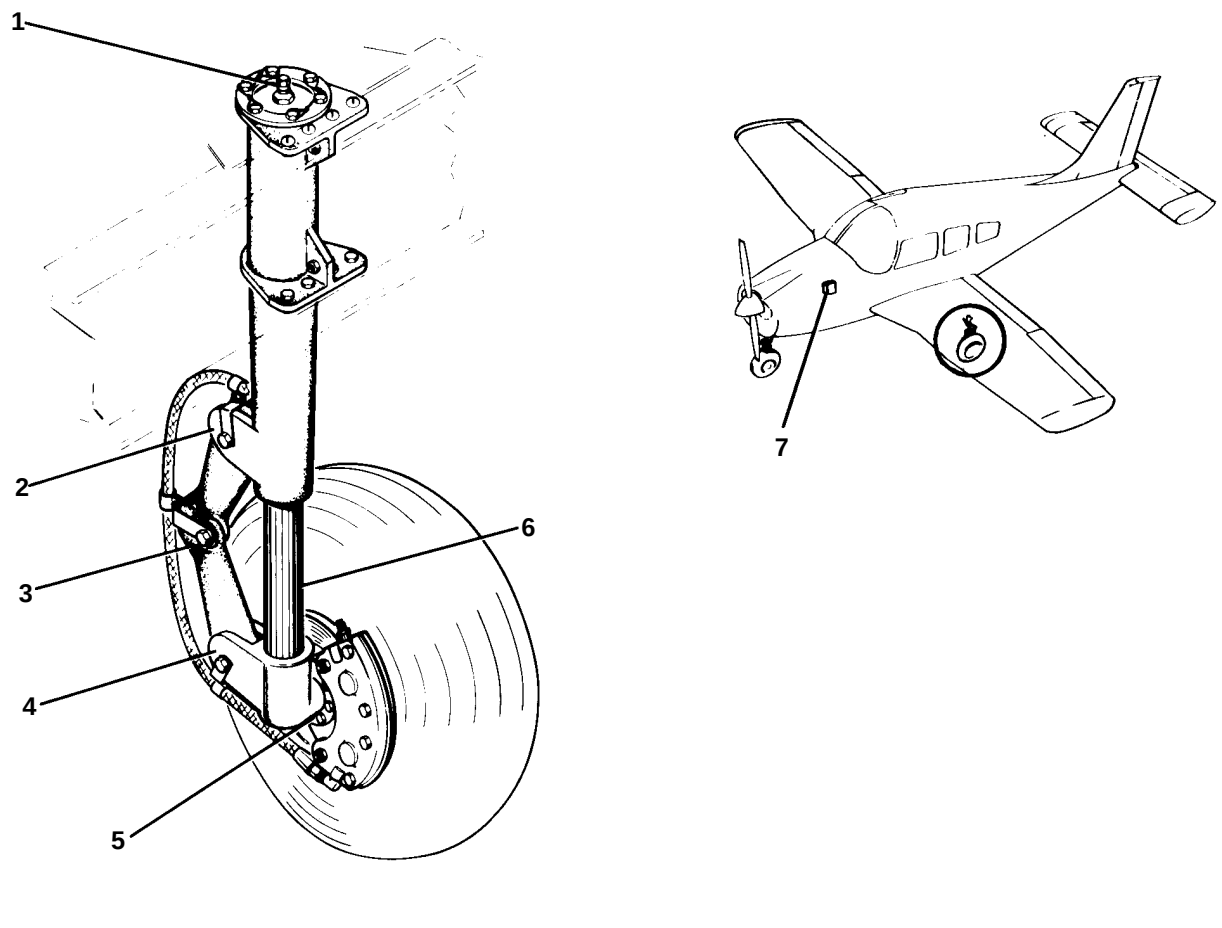


Figure 12-5. Lubrication Chart - Main Landing Gear

COMPONENT	LUBRICANT	FREQUENCY
1. OLEO STRUT FILLER POINT	MIL-H-5606	AS REQUIRED
2. STEERING BELLCRANK PIVOT POINT	MIL-L-7870	100 HRS
3. SHIMMY DAMPENER PIVOT POINT	MIL-L-7870	100 HRS
4. TORQUE LINK ASSEMBLY	MIL-L-7870	100 HRS
5. NOSE WHEEL BEARING	TEXACO MARFAX ALL PURPOSE GREASE OR MOBIL GREASE 77 (OR MOBIL EP2 GREASE) OR SHELL ALVANIA EP GREASE	2100 HRS
6. NOSE GEAR STEERING ROD END BEARINGS	MIL-L-7870	100 HRS
7. BUNGEE SEAL	PARKER O-RING LUBRICANT	100 HRS
8. EXPOSED OLEO STRUT	CARBON DIOXIDE RELEASE AGENT DRY LUBRICANT MS-122N/CO_2	100 HRS

SPECIAL INSTRUCTIONS

1. Nose Wheel Bearings - Disassemble and clean with a dry type solvent. Ascertain that grease is packed between the roller and cone. Do not pack grease in wheel housing. Wheel bearing~s require cleaning and repacking after exposure to an abnormal quantity of water.
2. Oleo Struts - Fill per instructions on unit or refer to service manual.
3. Bungee - Lubricate springs if bungee is disassembled.

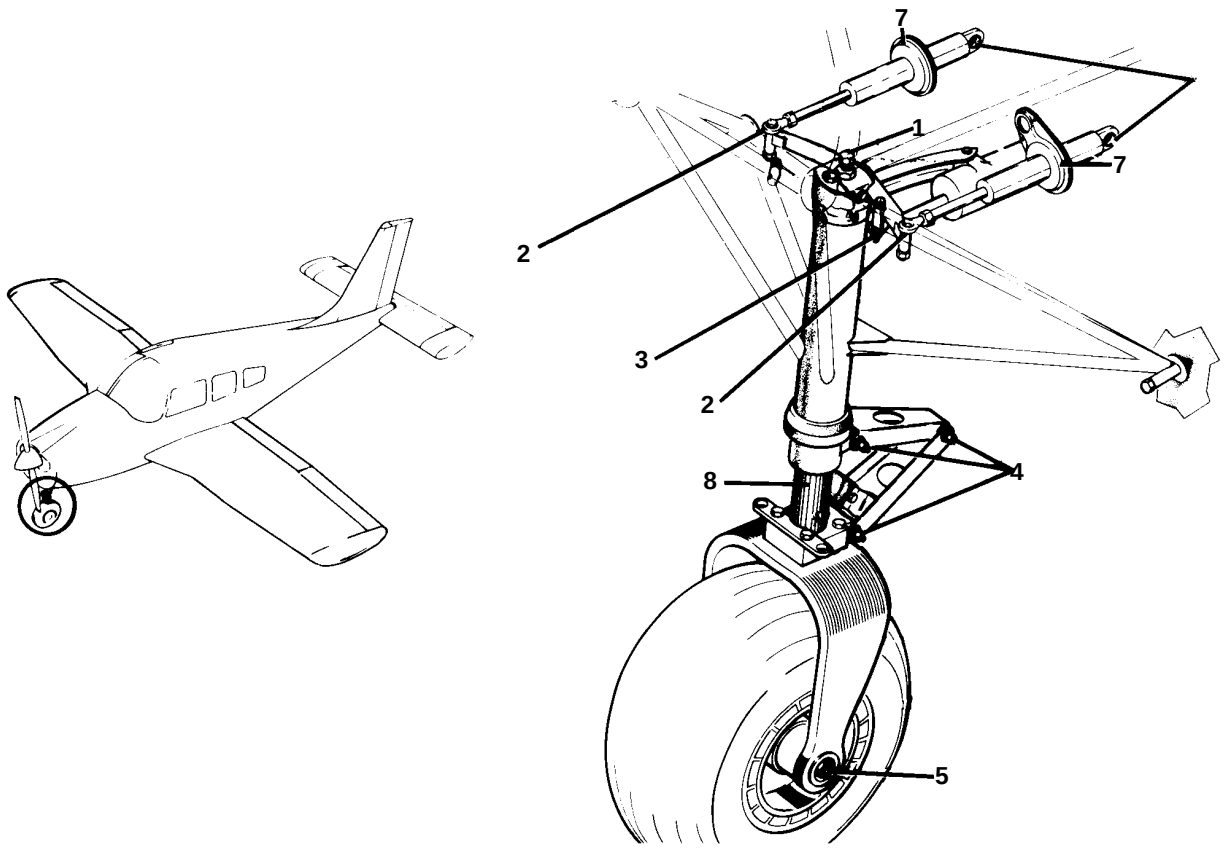


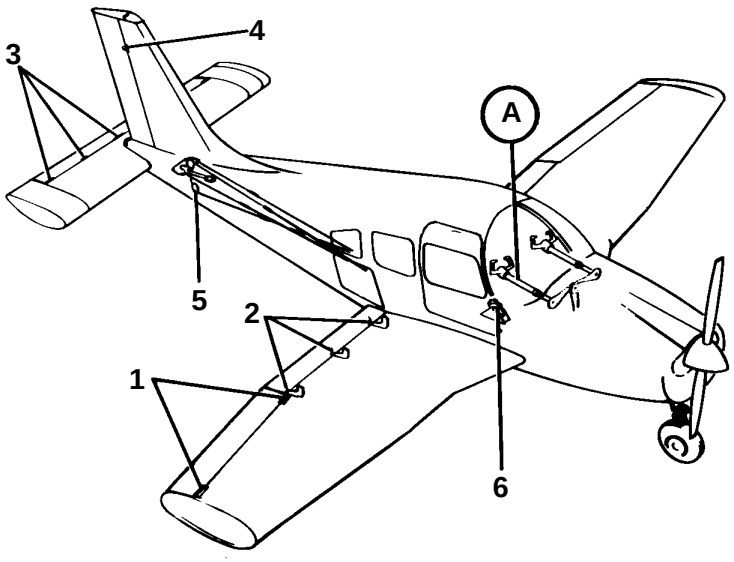
Figure 12-6. Lubrication Chart - Nose Landing Gear

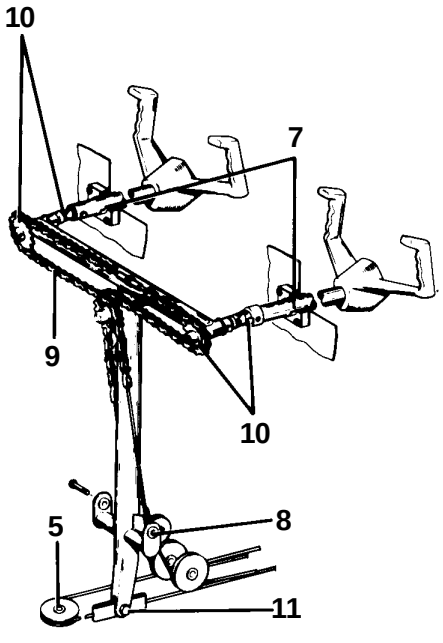
– CAUTION –
Do not lubricate control wheel shaft or bushing
Clean only. using alcohol or other suitable solvent.

COMPONENT	LUBRICANT	FREQUENCY
1. AILERON HINGE PINS	MIL-L-7870	100 HRS
2.. FLAP HINGE BEARINGS	MIL-L-7870	100 HRS
3. STABILATOR HINGE PINS	MIL-L-7870	100 HRS
4. RUDDER HINGE BEARINGS	MIL-L-7870	100 HRS
5. CONTROL CABLE PULLEYS	MIL-L-7870	100 HRS
6. TRIM CONTROL WHEEL OR OVERHEAD CRANK	MIL-L-7870	100 HRS
7. O-RING. CONTROL SHAFT BUSHING	PARKER O-RING 2 LUBRICANT	AS REQUIRED
8. TEE BAR PIVOT POINT	MIL-L-7870	100 HRS
9. CONTROL COLUMN CHAIN	MIL-L-7870	500 HRS
10. CONTROL COLUMN FLEX. JOINTS AND SPROCKET	MIL-L-7870	100 HRS
11. STABILATOR CONTROL	MIL-L-7870	100 HRS

SPECIAL INSTRUCTIONS

1. Aileron hinges with teflon sleeves should not be lubricated. Aileron hinges without teflon sleeves should first be cleaned with a dry type solvent then lubricated with MIL-L-7870.
2.. Disassemble O-ring retainer plates from instrument panel; lubricate O-ring and reassemble (on 1.125 Inch dia. shaft only).



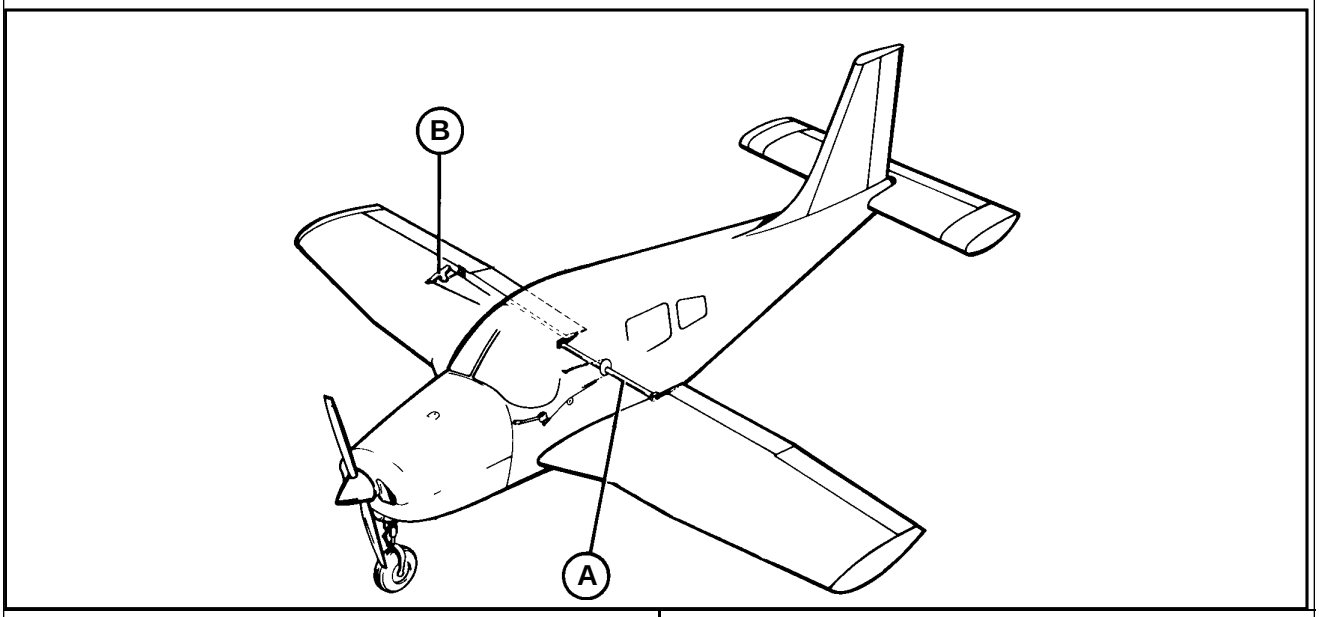


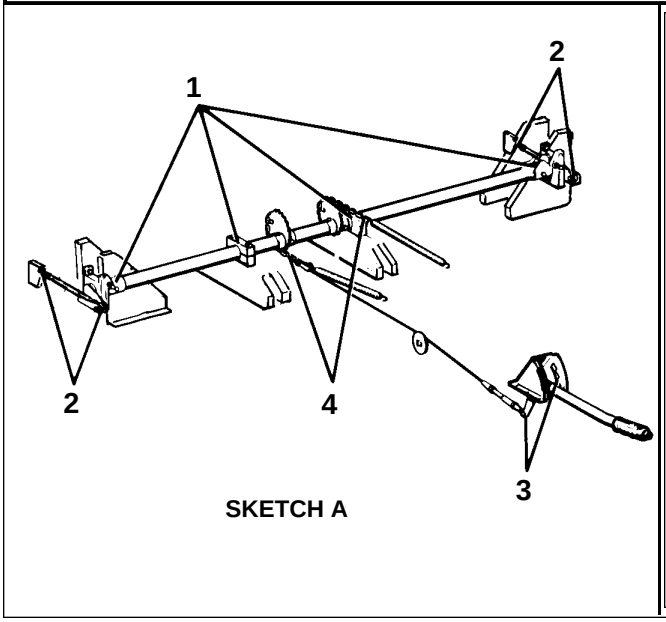
(TYPICAL)

SKETCH A

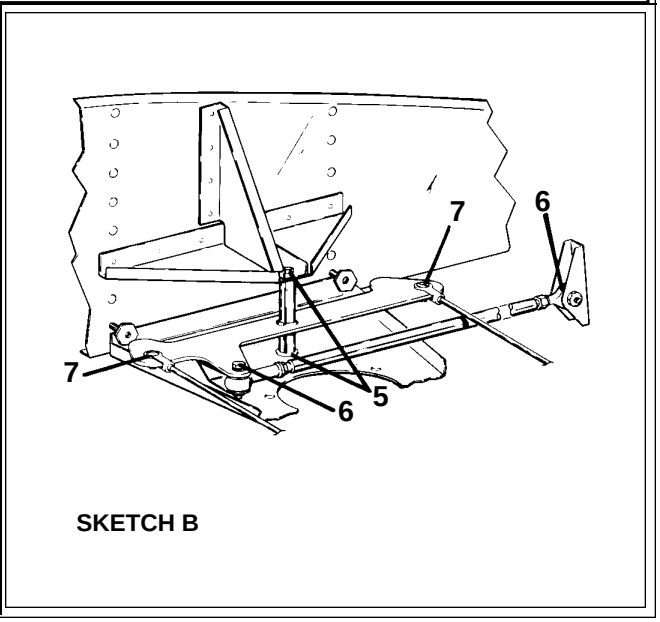
Figure 12-7. Lubrication Chart - Control System (Sheet 1 of 4)

COMPONENT	LUBRICANT	FREQUENCY
1. FLAP TORQUE TUBE BEARING BLOCKS	MIL-L-7870	100 HRS
2.. FLAP CONTROL ROD END BEARINGS	MIL-L-7870	100 HRS
3. FLAP HANDLE PIVOT POINT, LOCK MECHANISM, AND TURNBUCKLE END	MIL-L-7870	100 HRS
4. FLAP RETURN AND TENSION CHAINS	MIL-L-7870	500 HRS
5. AILERON BELLCRANK PIVOT POINTS	MIL-L-7870	100 HRS
6. AILERON CONTROL ROD END BEARINGS	MIL-L-7870	100 HRS
7. AILERON BELLCRANK CABLE ENDS	MIL-L-7870	100 HRS





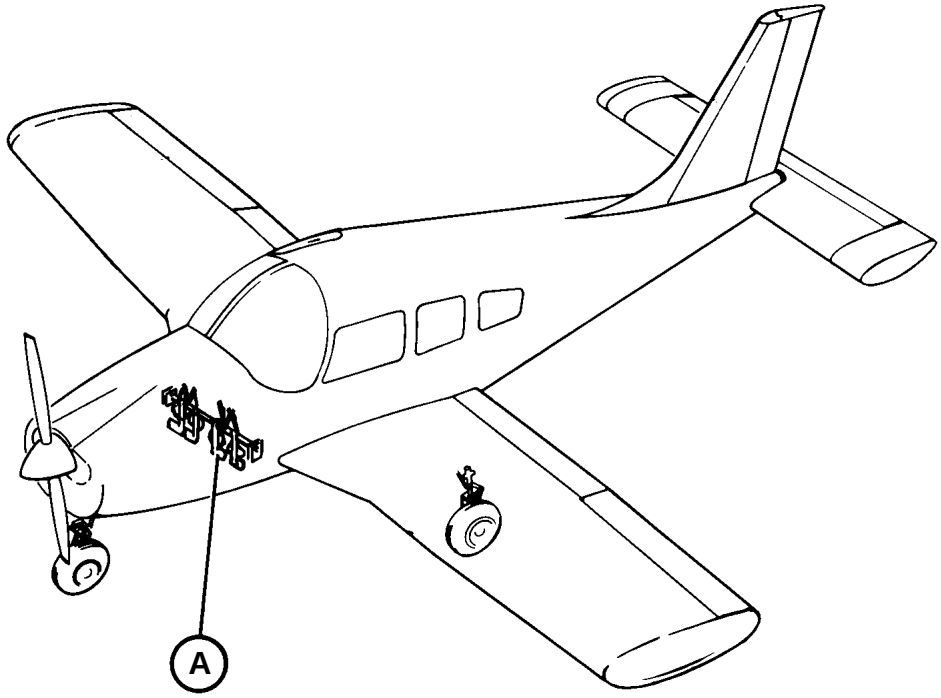
SKETCH A

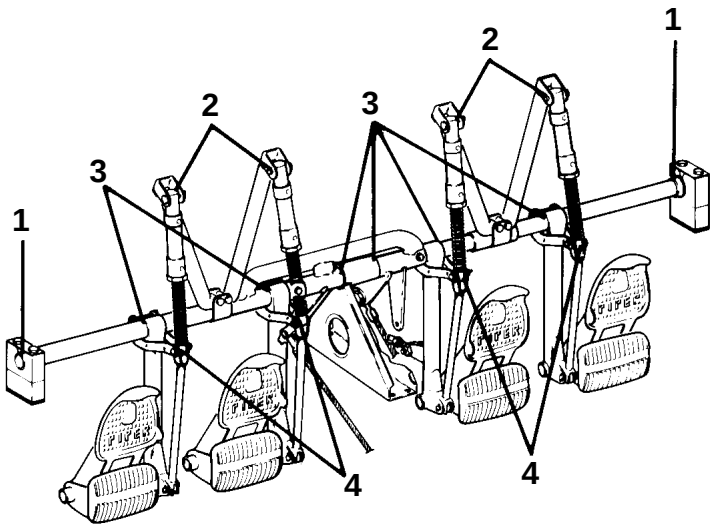


SKETCH B

Figure 12-7. Lubrication Chart - Control System (Sheet 2 of 4)

COMPONENT	LUBRICANT	FREQUENCY
1. RUDDER TUBE BEARING LOCKS	CARBON DIOXIDE RELEASE AGENT DRY LUBRICANT MS-122N/CO_2	100 HRS
2. TOE BRAKE CYLINDER ATTACHMENTS	MIL-L-7870	100 HRS
3. RUDDER TUBE CONNECTIONS	MIL-L-7870	100 HRS
4. BRAKE ROD ENDS	MIL-L-7870	100 HRS





SKETCH A

Figure 12-7. Lubrication Chart - Control System (Sheet 3 of 4)

COMPONENT	LUBRICANT	FREQUENCY
1. RUDDER ARM CABLE ENDS	MIL-L-7870	100 HRS
2. STABILATOR TRIM SCREW	LUBRIPLATE 907, FISKE BROS. REFINING CO.	100 HRS
3. STABILATOR SCREW/TAB LINKS	MIL-L-7870	100 HRS
4. STABILATOR HINGE POINTS	MIL-L-7870	100 HRS
5. RUDDER TRIM ASSEMBLY	MIL-L-7870	100 HRS

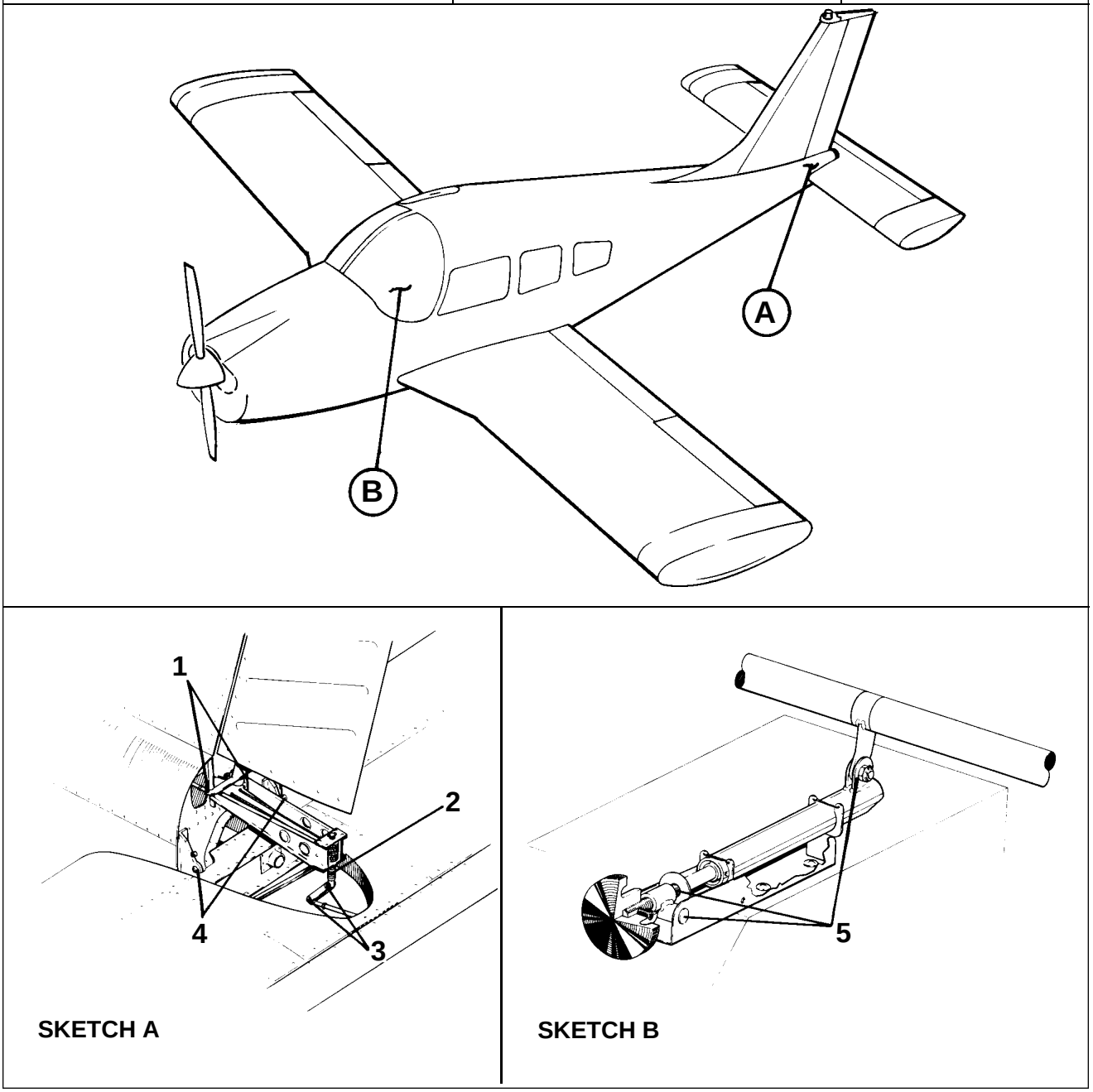


Figure 12-7. Lubrication Chart - Control System (Sheet 4 of 4)

COMPONENT	LUBRICANT	FREQUENCY
1. DOOR HINGES	MIL-L-7870	100 HRS
2 DOOR SEALS	CARBON DIOXIDE RELEASE AGENT DRY LUBRICANT MS-122N/CO_2	50 HRS
3 DOOR LATCH MECHANISMS	MIL-L-7870	500 HRS
4 SEAT TRACK ROLLERS, STOP PINS AND REAR	LUBRIPLATE 907, FISKE BROS. REFINING CO.	100 HRS

SPECIAL INSTRUCTIONS

Apply fluorocarbon dry lubricant to door seals at least once a month to prevent the seal from sticking, and improve sealing characteristics.

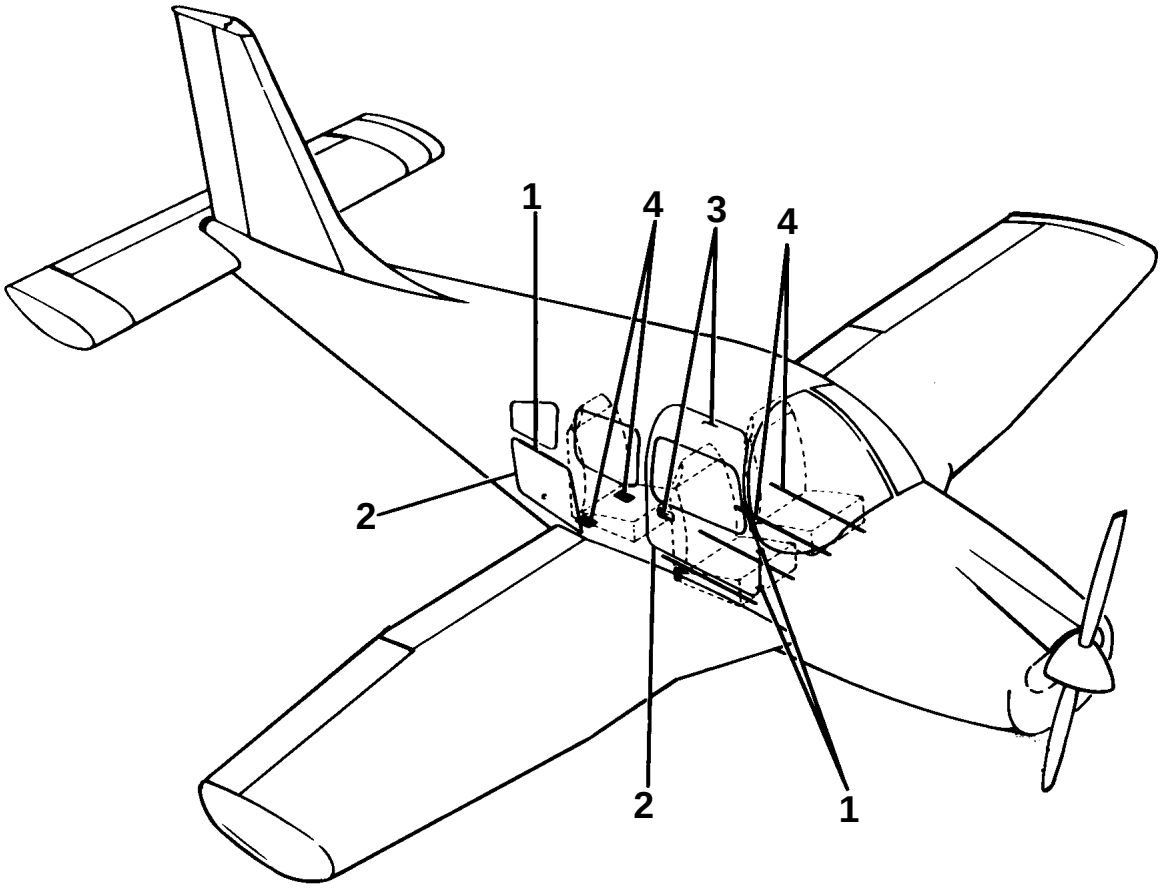


Figure 12-8. Lubrication Chart - Cabin Door, Baggage Door, and Seats

COMPONENT	LUBRICANT	FREQUENCY
1. ENGINE SUMP	MIL-L-6082 STRAIGHT MINERAL TYPE LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED, SAE 50 ABOVE 60°F AIR TEMP, SAE 40 30° TO 90°F AIR TEMP, SAE 30 0° TO 70°F AIR TEMP, SAE 20 BELOW 10°F AIR TEMP (SEE NOTE 1.)	50 HRS
2. CARTRIDGE TYPE OIL FILTERS		50 HRS
3. AIR FILTERS		50 HRS
4. ENGINE CONTROL AND ENVIRONMENTAL CONTROL PIVOT POINTS	MIL-L-7B70	100 HRS
5. FRESH AIR VENT SHAFTS	MIL-G-7711	500 HRS
6. ALTERNATOR IDLER PULLEY BEARING (IF INSTALLED)	MIL-G-81322	100 HRS

SPECIAL INSTRUCTIONS

1. Air Filter -To clean filter, tap gently to remove dirt particles. Do not blow out with compressed air or use oil. Replace filter if punctured or damaged.
2. Intervals between oil changes can be increased as much as 100% on engines equipped with full flow (cartridge type) oil filters, provided the specified octane fuel is used and the filter replaced each 50 hours of operation. Should fuel other than the specified octane rating for the power plant be used, refer to latest revision Lycoming Service Letter No. L185, for additional information and recommended service procedures.

NOTES

1. See the latest revision of Lycoming Service Instructions No. 1014 for use of ashless dispersant oil.
2. Lubricate alternator idler pulley bearing by removing front grease seal.

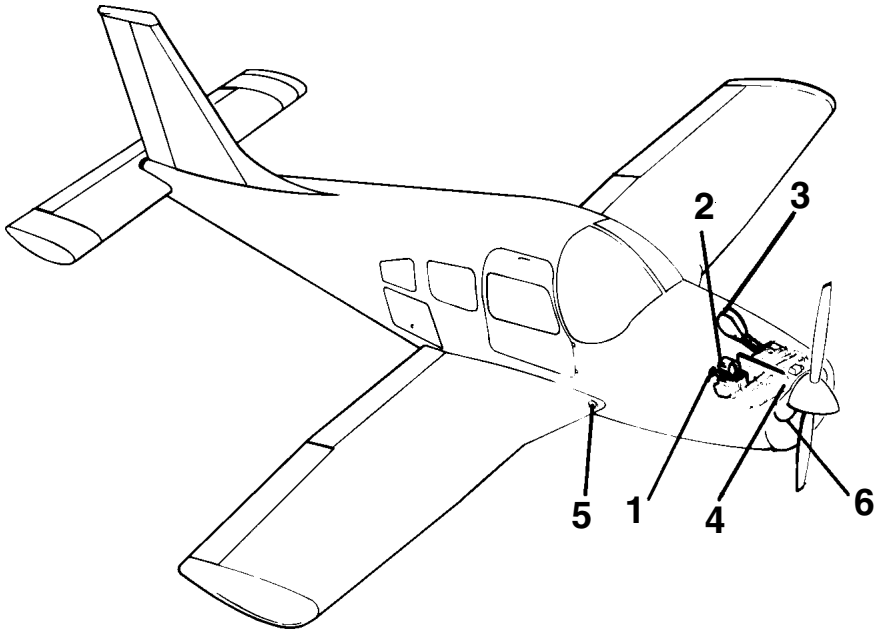


Figure 12-9. Lubrication Chart - Power Plant and Control Pivot Points

COMPONENT	LUBRICANT	FREQUENCY
1. CONDENSER HINGE AND ACTUATORS	MIL-L-7870	100 HRS
2. CONDENSER DOOR ACTUATING TRANSMISSION	MIL-G-23827	500 HRS

SPECIAL INSTRUCTIONS

Transmission to be 1/2 full of grease. Apply grease during assembly and lubricate transmission ball nut and screw with MIL-G-23827 grease.

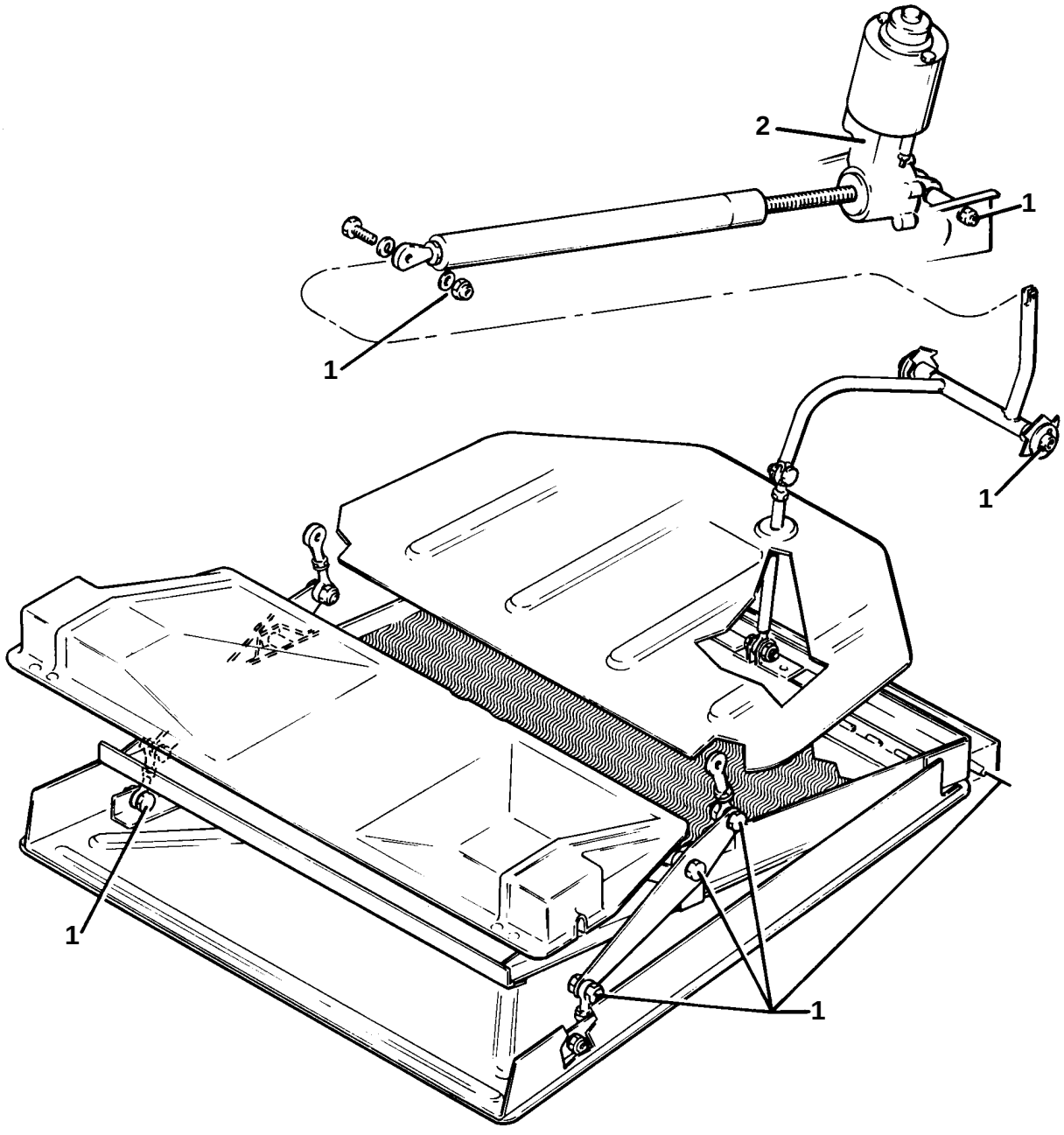


Figure 12-10. Lubrication Chart - Air Conditioning Condenser

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

20

STANDARD PRACTICES/ AIRFRAME

1E19

CHAPTER 20 - STANDARD PRACTICES / AIRFRAME

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
20-00-00	GENERAL	1E21	
20-10-00	STANDARD PRACTICES - AIRFRAME	1E22	
20-10-00	Torque Wrenches	1E22	
21-10-00	Method For Instaling Rod End Bearings	1E23	
20-10-00	Cherrylock Rivets, Removal	1E23	
20-10-00	Identification of Fluid Lines	1E24	
20-10-00	Flareless Tube Assemblies	1F1	
20-10-00	Support Clamps	1F3	
20-10-00	Dye Penetrant Inspection	1F3	
20-20-00	AIRCRAFT FINISH CARE (CLEANING)	1F4	
20-20-00	Exterior Surfaces	1F4	
20-20-00	Windshield and Windows	1F4	
20-20-00	Headliner, Side Panels and Seats	1F5	
20-20-00	Carpets	1F5	
20-20-00	Engine Compartment	1F5	
20-20-00	Fuel System	1F6	
20-20-00	Landing Gear	1F6	
20-30-00	CORROSION	1F8	
20-30-00	Conditions Affection Corrosion	1F8	
20-30-00	Inspection	1F8	
20-30-00	Corrosion Removal and Control	1F8	
20-30-00	Areas Prone to Corrosion	1F10	
20-40-00	PAINTING	1F12	
20-40-00	Painting Safety	1F12	
20-40-00	Polyurethane Paint Safety	1F12	
20-40-00	Paint Application	1F13	
20-40-00	Painting Sequence	1E14	
20-40-00	Color Matching	1F14	
20-40-00	Trim and Registration Numbers	1F14	
20-40-00	Paint System Compatability	1F15	
20-40-00	Common Paint Troubles	1F15	
20-40-00	Storage	1F16	
20-40-00	Painting Facility	1F16	
20-40-00	Waxing	1F16	

GENERAL

This chapter contains general information pertaining to standard aircraft hardware installation and removal practices.

For standard repair practices of a minor nature, refer to AC 43.13.

If non-destructive testing is necessary after a repair such as welding, magniflux must be used on materials made from 4130 steel (such as engine mounts and seat frames).

Use the dye penetrant method for testing and inspecting aluminum castings and machined aluminum parts.

Usually, a thorough visual inspection with 10X magnifying glass will show any damage or defect that is of a significant nature.

THIS SPACE INTENTIONALLY LEFT BLANK

STANDARD PRACTICES - AIRFRAME.

A. TORQUE WRENCHES

Torque wrenches should be checked daily and calibrated by means of weights and a measured lever arm to make sure that inaccuracies are not present. Checking one torque wrench against another is ***not*** sufficient and is ***not*** recommended. Some wrenches are quite sensitive as to the way they are supported during a tightening operation. Any instructions furnished by the manufacturer must be followed explicitly.

When it is necessary to use a special extension or adapter wrench together with a torque wrench, a simple mathematical equation must be worked out to arrive at the correct torque reading. Following is the formula to be used: (Refer to figure 20-1.)

T = Torque desired at the part.

A = Basic lever length from center of wrench shank to center of handle or stamped on wrench or listed for that model wrench.

B = Length of adapter extension, center of bolt to center of shank.

C = Scale reading needed to obtain desired torque (T).

$$\text{The formula:} \quad C = \frac{A \times T}{A + B}$$

EXAMPLE: A bolt requires 30 foot pounds and a 3 inch adapter (one-quarter of a foot or 0.25') is needed to get at it. You want to know what scale reading it will take on a one-foot lever arm wrench to obtain the 30 foot pounds at the bolt.

$$C = \frac{1 \times 30}{1 + 0.25} \quad \text{or} \quad C = \frac{30}{1.25} = 24 \text{ ft-lb}$$

The 3 inch adapter must be projecting 3 inches straight along the wrench axis. Avoid all ***complex*** assemblages or adapters and extensions of flex joints.

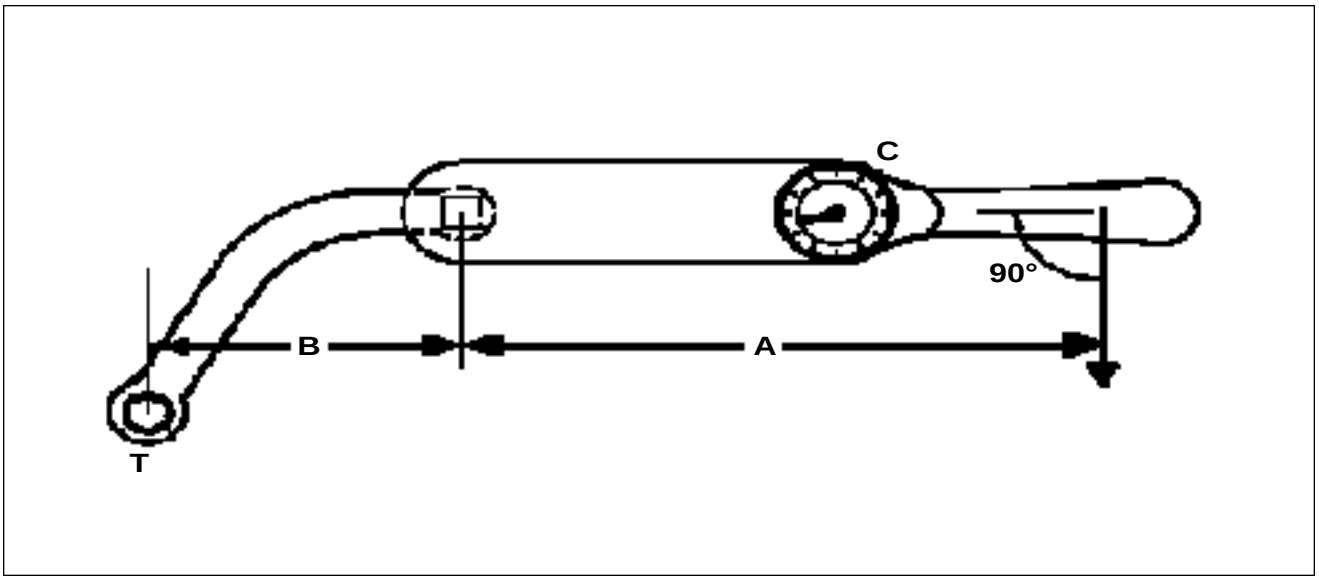


Figure 20-1. Torque Wrench Formula

B. METHOD FOR INSTALLING ROD END BEARINGS

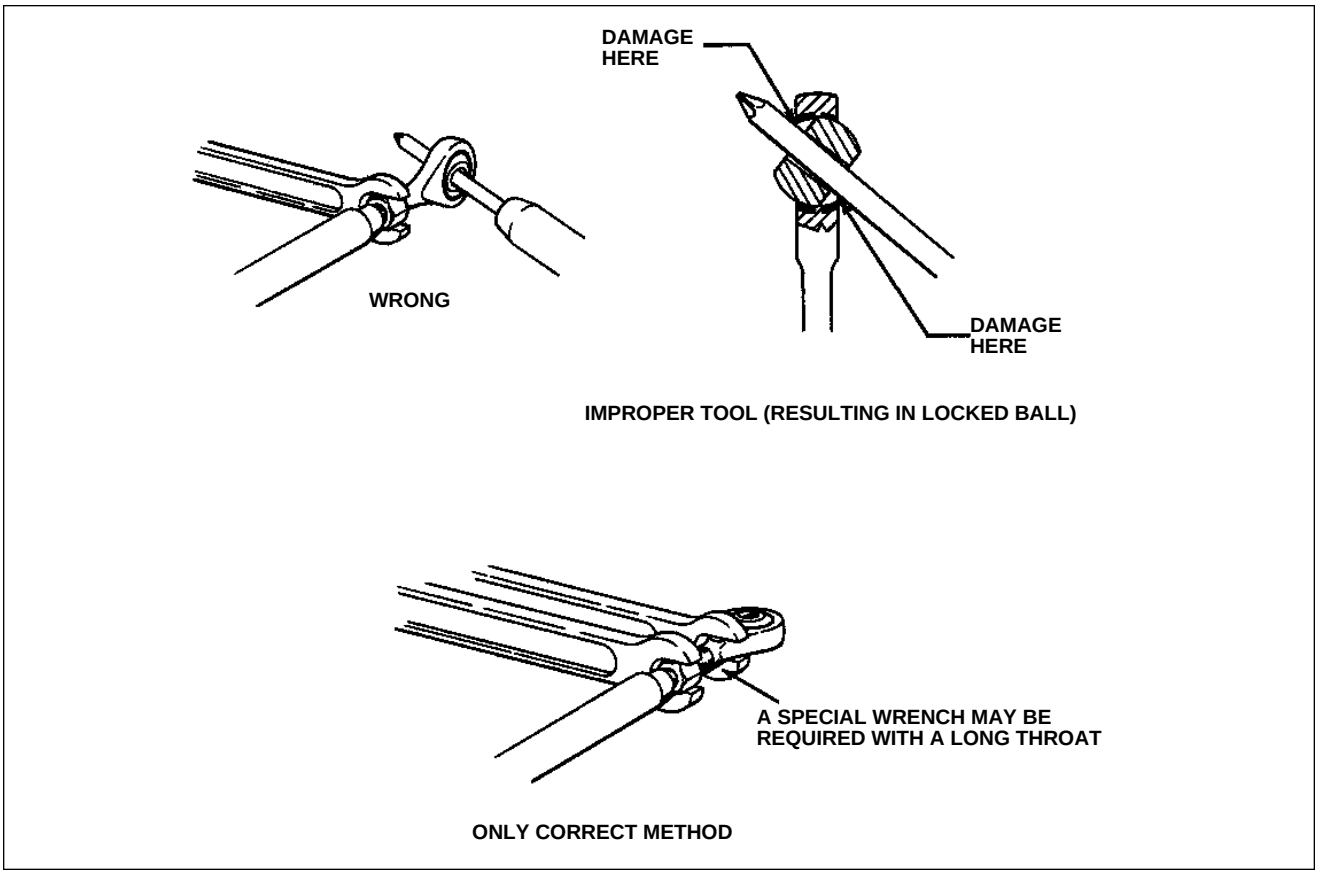

DAMAGE HERE
WRONG
DAMAGE HERE
IMPROPER TOOL (RESULTING IN LOCKED BALL)
A SPECIAL WRENCH MAY BE REQUIRED WITH A LONG THROAT
ONLY CORRECT METHOD

Figure 20-2. Installing Rod End Bearings

C. REMOVAL OF CHERRYLOCK RIVETS (Refer to Figure 20-2.)

1. Remove an installed cherrylock rivet as follows:

— CAUTION —

Do not drill completely through the rivet sleeve to remove a rivet. Excessive drilling will enlarge hole.

a. In thick material, remove lock by driving out rivet stem, using a tapered steel drift pin. (See view 1..)

For rivets installed in thin sheets, driving out the locked stem can damage the sheet. Use a small center drill to provide a guide for larger drill on top of rivet stem, and drill away tapered portion of the stem to destroy the lock. (See views 2 and 3.)

b. Pry remainder of locking collar out of rivet head with drift pin. (See view 3.)
c. Drill nearly through head of rivet, using same size drill as rivet shank. (See view 4.)
d. Break off rivet head, using drift pin as a pry. (See view 5.)
e. Drive out remaining rivet shank with pin having a diameter equal to rivet shank. (See view 6.)

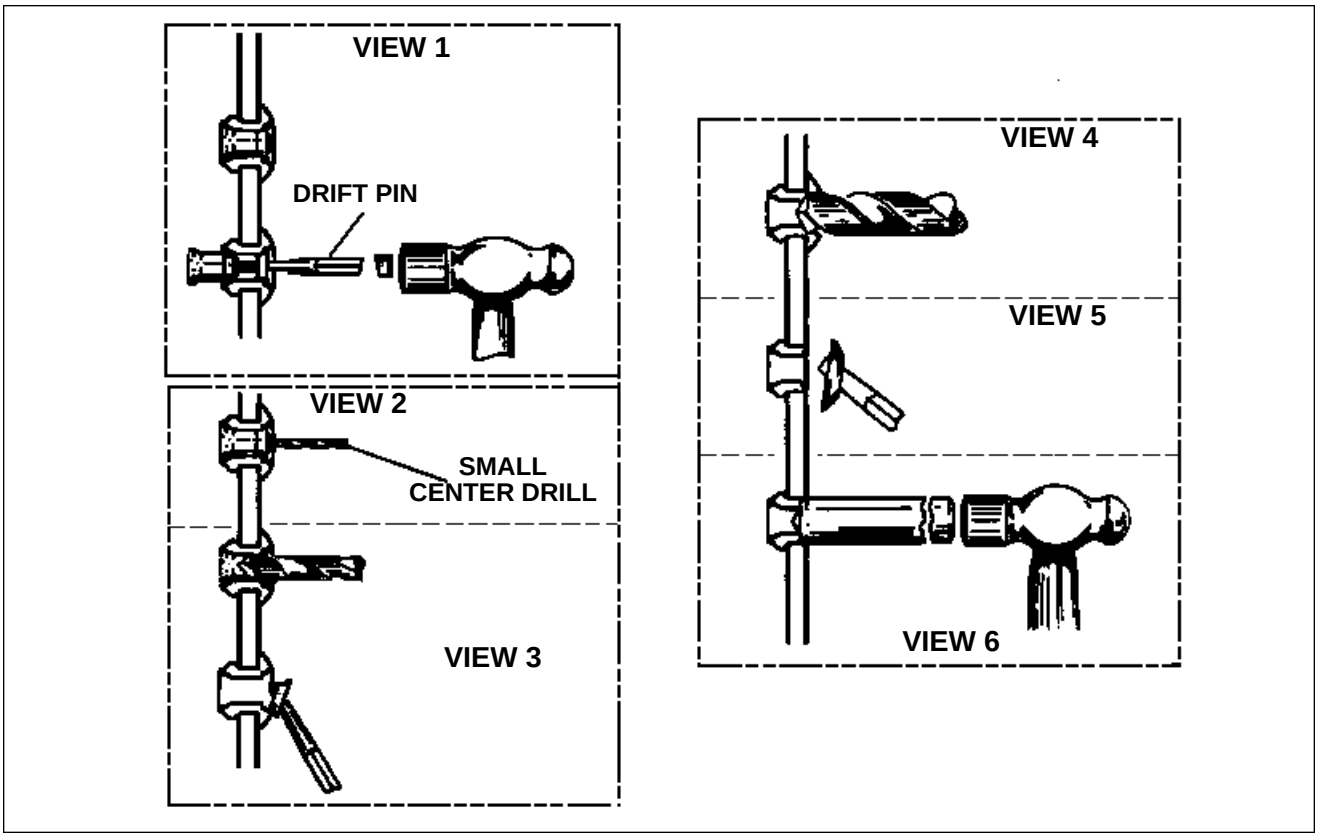


Figure 20-3. Cherrylock Rivet Removal

D. IDENTIFICATION OF FLUID LINES (Refer to figure 20-4.)

Aircraft fluid lines are identified by color coded markers, words, and geometric symbols. Markers identify each line's function, content, primary hazard, and the direction of fluid flow.

Fluid lines are marked with one-inch tape or decals. Paint is used on lines in engine compartments, where there is the possibility of tapes, decals, or tags being drawn into engine induction system.

Lines may be identified as to specific function within a system; for example, DRAIN, VENT, PRESSURE, or RETURN.

Lines conveying fuel may be marked FLAM; lines containing toxic materials are marked TOXIC in place of FLAM. Lines containing physically dangerous materials, such as oxygen, nitrogen, or Freon, are marked PHDAN.

Aircraft and engine manufacturers are responsible for original installation of identification markers. The aviation mechanic is responsible for marker replacement when necessary.

Tapes and decals are placed on both ends of a line and at least once in each compartment through which line runs. Identification markers are placed immediately adjacent to each valve, regulator, filter, or other accessory within a line. Where paint or tags are used, location requirements are per tapes and decals.

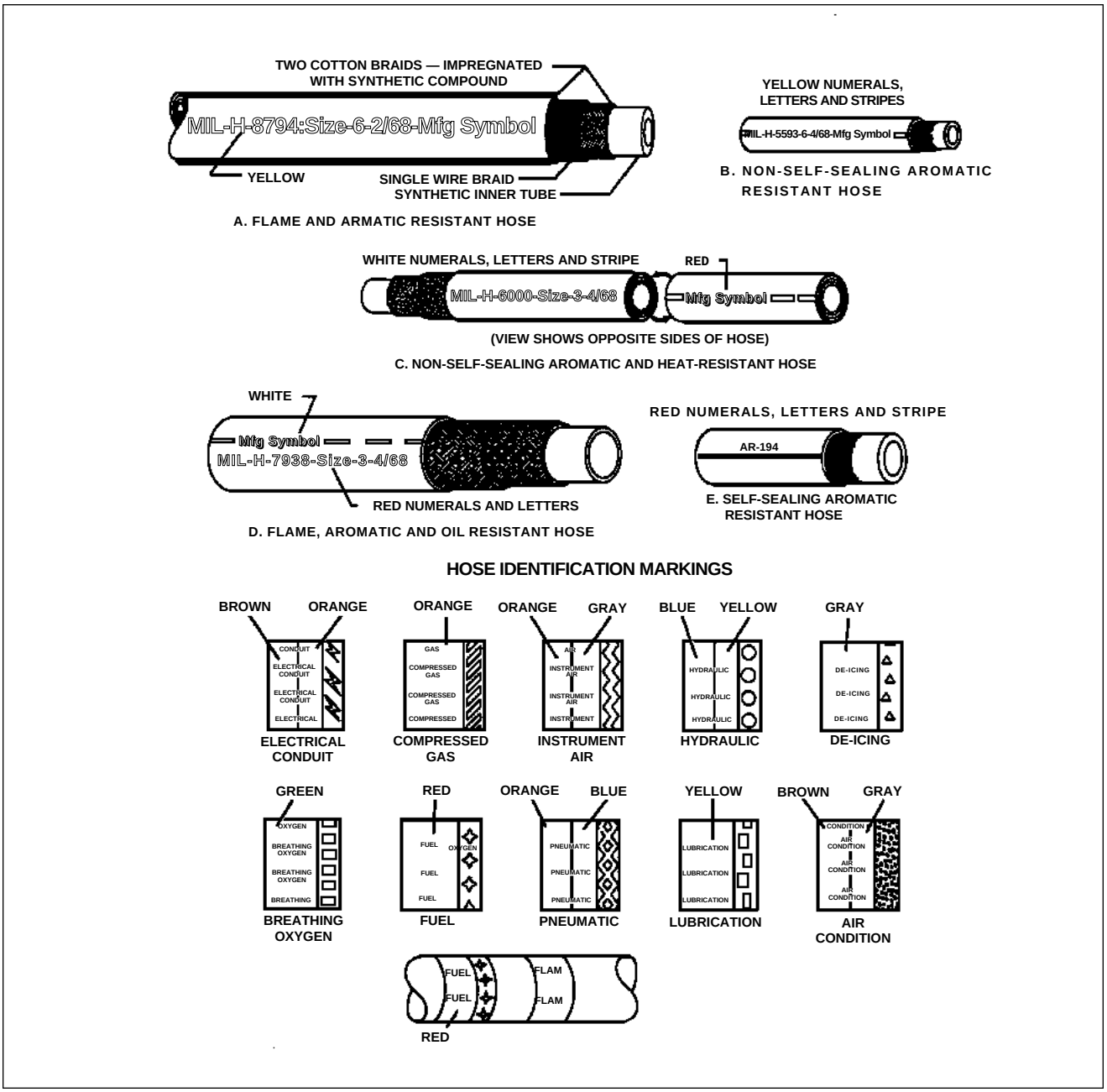


Figure 20-4. Hose and Line Markings

E. FLARELESS TUBE ASSEMBLIES. (Refer to figure 20-5.)

Flareless tube fittings eliminates all tube flaring, but presetting is necessary prior to installation of a new flareless tube assembly. Perform presetting as follows:

1. Cut tube to correct length, with ends perfectly square. Deburr inside and outside of tube. Slip nut, then sleeve, over tube (step 1).

2. Lubricate threads of fitting and nut. See figure 20-5 for proper lubricant. Place fitting in vise (step 2), and hold tubing firmly and squarely on seat in fitting. Tube must bottom firmly in fitting. Tighten nut until cutting edge of sleeve grips tube. This point is determined by slowly turning tube back and forth while tightening nut. When tube no longer turns, nut is ready for final tightening.
3. Final tightening depends upon tubing. For aluminum alloy tubing up to and including 1/2 inch outside diameter, tighten nut from 1 to 1-1/6 sixth turns. For steel tubing and aluminum alloy tubing over 1/2 inch outside diameter, tighten from 1-1/6 to 1-1/2 turns.
4. After presetting sleeve, disconnect tubing from fitting. Check the following points per step 3:
   a. Tube must extend 3/32 to 1/8 inch beyond sleeve pilot; otherwise blowoff may occur.
   b. Sleeve pilot must contact tube or have a maximum clearance of 0.005 inch for aluminum alloy tubing or 0.015 inch for steel tubing.
   c. A slight collapse of tube at sleeve cut is permissible. No movement of the sleeve pilot, except rotation, is permissible.

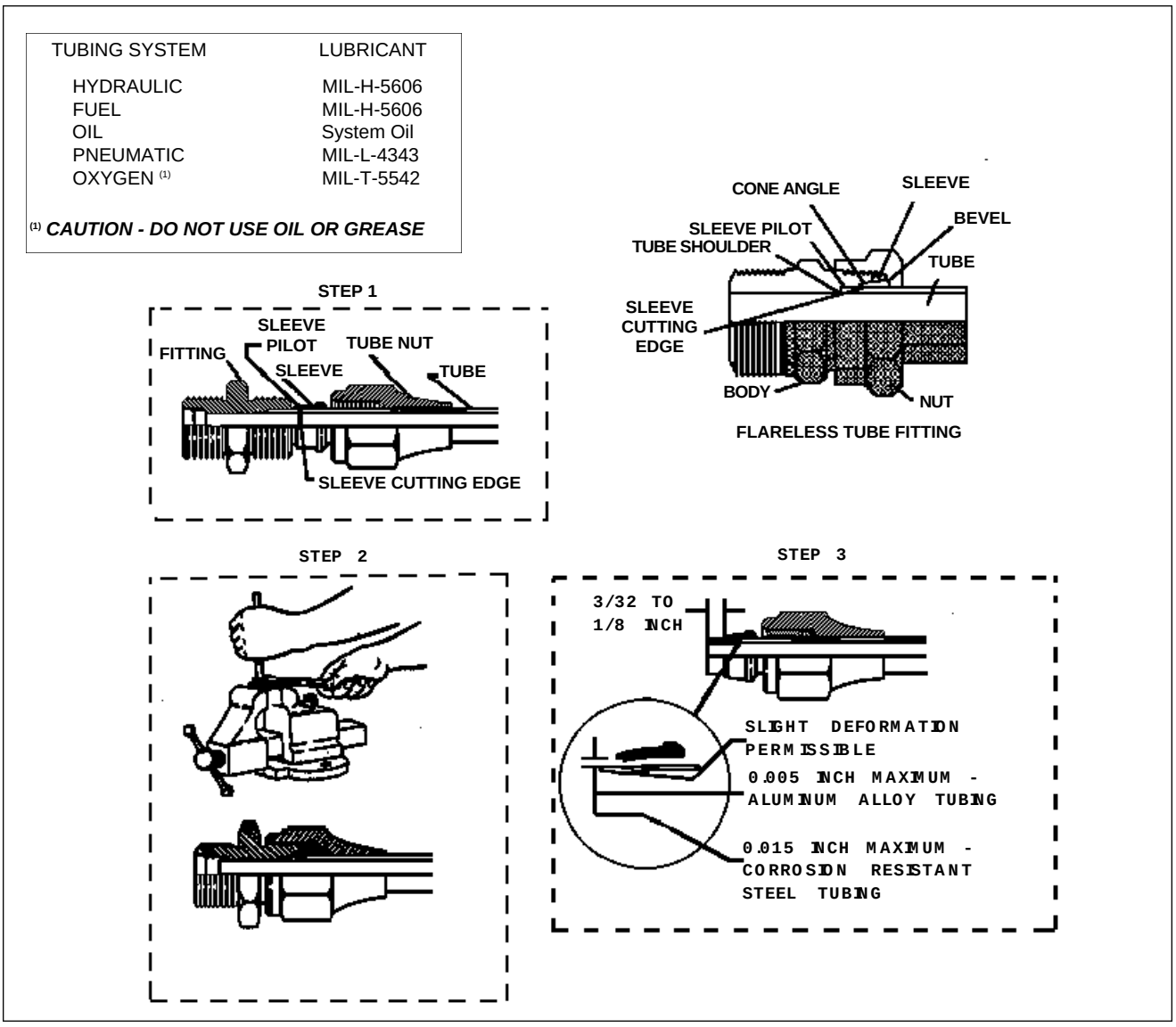


Figure 20-5. Flareless Tube Fittings

F. SUPPORT CLAMPS

— CAUTION —

Be sure clamps are proper size. Clamps or supporting clips smaller than outside diameter of hose will restrict fluid flow through hose.

1. Support clamps are used to secure various lines to airframe or powerplant assemblies. Different types of support clamps are as follows:
   a. Rubber cushioned - used to secure lines subject to vibration. The cushioning prevents chafing of tubing.
   b. Plain clamp - used to secure lines not subject to vibration.
   c. Teflon cushioned - used in areas where the deteriorating effect of Skydrol 500, hydraulic fluid (MIL-H-5606), or fuel is expected, These clamps do not provide as good vibration dampening effects as other cushion clamps.
   d. Bonded clamps - used to secure metal hydraulic, fuel, and oil lines. Paint or anodizing must be removed from the section of tube at bonding clamp.
   e. Unbonded clamps - used only for securing wiring.
2. All plumbing lines must be secured at specified intervals. The maximum distance between supports for rigid fluid tubing is shown in chart 2001.

CHART 2001. MAXIMUM DISTANCE BETWEEN SUPPORTS FOR FLUID TUBING

TUBE OD (IN.)	DISTANCE BETWEEN SUPPORTS (IN.) ALUMINUM ALLOY	STEEL
1/8	9-1/2	11-1/2
3/16	12	14
1/4	13-1/2	16
5/16	15	18
3/8	16-1/2	20
1/2	19	23
5/8	22	25-1/2
3/4	24	27-1/2
1	26-1/2	30

G. DYE PENETRANT INSPECTIONS

NOTE

Thje following procedure is general in nature. See manufacture's instructions, included with dye penetrant kit, for specifics.

1. Using a volatile cleaner, thoroughly remove dirt, loose scale, oil and grease from surface to be inspected.
2. Heat surface to at least 70°F (21°c), but not exceeding 130°F. (54°c)
3. Apply penetrant by brushing, spraying, or dipping. Let stand 2 to 15 minutes, depending on temperature.
4. Remove surplus penetrant by applying special cleaner recommended by penetrant manufacturer, or by rinsing with water. Allow housing to dry.
5. Apply a light, even coat of developer by spraying, brushing, or dipping. Cracks or other opening in surface being inspected will appear as bright red. An indication of size of the defect may be obtained by watching the size and rate of growth of red indication.

AIRCRAFT FINISH CARE (CLEANING)

A. EXTERIOR SURFACES

— CAUTION —

Harsh abrasives or detergents used on painted or plastic sur - faces will scratch or corrode metal surfaces.

— CAUTION —

Cover areas where cleaning solution could cause damage.

1. Wash airplane as follows:
   a. Flush away loose dirt with water.
   b. Apply mild soap and water with a rag, sponge, or soft bristle brush.
   c. Remove stubborn oil and grease with a cloth dampened with naptha.
   d. Where exhaust stains exist allow solution to remain on the surface longer.
   e. Use automotive wax to preserve painted surfaces. Soft cleaning cloths or chamois must be used to prevent scratches when cleaning or polishing. A heavier wax coating on leading surfaces will reduce abrasion problems in these areas.

B. WINDSHIELD AND WINDOWS

— CAUTION —

Do not rub surfaces harshly.

— CAUTION —

Do not use a circular rubbing motion.

— CAUTION —

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

1. Remove dirt, mud, etc, from exterior surfaces with clean water.
2. Wash with mild soap and warm water, or an aircraft plastic cleaner. Use soft cloth or sponge and a straight rubbing motion.
3. Remove oil and grease with cloth moistened with kerosene.
4. Apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
5. Remove severe scratch or mar in plastic by using jeweler’s rouge to rub out scratch. Smooth both sides and apply wax.
6. Improve visibility through windshield and windows by using rain repellent such as REPCON. Windshield and window surfaces treated become so smooth water beads up and readily flows off surface. Apply REPCON in accordance with manufacturer’s instructions. (Refer to Chart 9105, List of Consumable Materials for specifications and manufacturer’s address.)

C. HEADLINER, SIDE PANELS, AND SEATS

— CAUTION —

Solvent cleaners must have adequate ventilation.

— CAUTION —

Do not soak or harshly rub material.

1. Clean headliner, side panels, and seats with a stiff brush and vacuum.
2. Clean soiled upholstery, except leather, by using an approved air drying type cleaner or foam upholstery cleaner. Carefully follow manufacturer's instructions.
3. Clean leather material with saddle soap and mild soap and water.

D. CARPETS

1. Remove dirt by using a small whisk broom or vacuum.
2. Clean soiled spots with a non-inflammable dry cleaning fluid.

E. ENGINE COMPARTMENT

— CAUTION —

Do not spray solvent into alternator, starter, vacuum pump, air intake, alternator air inlets, and magneto vents.

— CAUTION —

Place strips of tape over vents for protection.

1. Place a pan under engine to catch waste.
2. Place strips of tape over vents for protection.
3. Remove engine cowling.
4. Spray or brush engine with solvent or a mixture of solvent and degreaser. (Brush sprayed areas where heavy grease and dirt deposits have collected.)

— CAUTION —

Do not operate engine until excess solvent has evaporated or otherwise been removed.

5. Let solvent on engine for five to ten minutes; rinse engine clean with additional solvent and let dry.
6. Remove all protective covers.
7. Lubricate controls, bearing surfaces, etc, per Lubrication Charts. (Refer to chapter 12.)

F. FUEL SYSTEM

Flush fuel tanks and selector valve as follows:

1. Disconnect fuel line at carburetor.
2. Select a fuel tank.
3. Turn on electric fuel pump and flush fuel through system until there is no dirt or foreign matter in fuel tank or valve. (Agitation of fuel within tank will help pick up and remove dirt.)
4. Repeat procedure for each tank.
5. Clean all filters when all tanks are flushed.

G. LANDING GEAR

— CAUTION —

Place a plastic cover over wheel and brake assembly.

1. Place a pan under the gear to catch waste.
2. Spray or brush gear area with solvent or a mixture of solvent and degreaser. (Brush sprayed areas where heavy grease and dirt deposits collect.)
3. Let solvent remain on gear from five to ten minutes; rinse gear with additional solvent and let dry.
4. Remove plastic cover from wheel. Remove catch pan.
5. Lubricate gear per Lubrication Chart. (Refer to chapter 12.)

THIS SPACE INTENTIONALLY LEFT BLANK

CORROSION

A. CONDITIONS AFFECTING CORROSION

Some conditions affecting corrosion are:

1. Heat and humidity.
2. Different metals and their relative sizes.
3. Frequent contributing factors to corrosion:
   a. Soil and atmosphere dust.
   b. Oil, grease, and exhaust residues.
   c. Salt water and salt moisture condensation.
   d. Spilled battery acids and caustic cleaning solution.
   e. Welding, brazing, and soldering flux residue.

A clean aircraft will resist corrosion better than a dirty one. Cleaning frequency depends on geographical location, type of operation, etc. Remove soil as soon as possible, especially when in a high temperature area.

After cleaning, verify that no cleaning solution remains in holes, crevices, or joints that may lead to increased corrosion. All exposed areas (landing gear, flap tracks, control surface, hinge parts, etc) must be lubricated after cleaning.

B. INSPECTION

— CAUTION —

Inspection for corrosion must be performed by personnel familiar with corrosive problems and remedies.

Check for corrosion at every inspection. In trouble areas, inspection frequency must be increased.

In addition to routine inspections:

1. Aircraft operating around a marine environment must be given special inspections on a weekly basis.
2. Aircraft operating in semi-acid conditions must be inspected monthly. Semi-acid conditions are likely to occur in industrialized areas. Sulphur-bearing particles in dust, smoke, and smog attack painted surfaces.
3. Inspection for corrosion must be performed by personnel familiar with corrosive problems and remedies.
   a. Daily and preflight inspection must include engine frontal areas, all intake vents, engine compartments, gaps, seams, faying surfaces in exterior skins, wheel, wheel well areas, battery compartment, fuel cell, all other drains, and any bilge areas not requiring ex- tensive removal of inspection access covers.
   b. Detailed inspection must include above referenced areas along with areas requiring removal of inspection plates and panels to thoroughly inspect internal cavities of aircraft.
4. Paint tends to hide corrosion in its initial stages. The results of corrosion can sometimes be seen as blisters, flakes, chips, and other irregularities in paint.

C. CORROSION REMOVAL AND CONTROL

— CAUTION —

The depth of material removed must not exceed safe limits.

— CAUTION —

Removal of severe corrosion may be considered a major repair. This type repair must be FAA approved before airplane returns to service.

Corrosion cannot be prevented or eliminated on aircraft. It can only be reduced to an acceptable level by proper control methods.

All corrosion products must be removed prior to refinishing. If not removed, corrosion will begin again, even though affected area is refinished.

Before beginning any rework:

1. Position airplane in a wash rack or provide some type of washing apparatus for rapid rinsing of all surfaces.
2. Connect static ground line to airplane.
3. Remove airplane battery if required.
4. Protect pitot-static ports, engine openings, airscoops, louvers, wheels, tires, and other por- tions of airplane from moisture and chemical brightening agents.
5. Protect surfaces next to rework areas from chemical paint strippers, corrosion removal agents, and surface treatment materials.

Evaluate corrosion damage to determine type and extent of repairs required. Proceed as follows:

1. Light Corrosion: discoloration or pitting. Remove by light hand sanding or a small amount of chemical treatment.
2. Moderate Corrosion: similar to light corrosion except there is blistering or evidence of scaling and flaking. Remove by extensive hand or mechanical sanding.
3. Severe Corrosion: similar to moderate corrosion with severe blistering, exfoliation, scaling, or flaking. Remove by extensive mechanical sanding or grinding.

CHART 2002. TYPES OF METAL CORROSION

TYPE OF MATERIAL	TYPE OF CORROSION	REMEDY (2)
Steel	Rust (1)	Complete removal of corrosion by mechanical means
Aluminum	White to grey powdery material	Mechanical polishing or brushing with material softer than aluminum
Magnesium (highly susceptible to corrosion)	White powdery snow-like mounds and white spots	Mechanical polishing or brushing for a smooth finish
Cadmium (plating)	White to brown to black mott ling of surface (plating is still protecting until iron appears)	Mechanical removal of corrosion is limited to metal surfaces from which cadmium has been depleted
Chromium (plating)	May pit in chloride environment	Polishing and buffing

(1) Red rust generally shows on bolts, nuts, and other aircraft hardware. Rust in these areas is generally not dangerous. It shows a need for maintenance and the possibility of corrosive attack in more critical areas.

Any surface corrosion on highly stressed steel parts is potentially dangerous. A careful removal of corrosion using mild abrasives (rouge or fine grit aluminum oxide paper) is necessary. Do not overheat metal when removing corrosion.

(2) For abrasion, do not use dissimilar material (for example steel wool on aluminum). Remove only material required to clean affected area.

D. AREAS PRONE TO CORROSION

Certain areas are more prone to corrosion. The following list is a general guide to areas where corrosion is frequently found.

1. Areas around steel fasteners are susceptible to corrosion. Each time the fastener is removed, it must be coated with zinc chromate before installation.
2. Fluids seep into faying surfaces, seams, and joints. This type of corrosion is usually detected by irregularities in skin's surface.
3. Spot welded assemblies are prone to corrosion. On an aluminum spot welded assembly, a chromate conversion coating before paint is applied will help prevent corrosion.
4. Areas exposed to exhaust gases may have their finish damaged by deposits. Heat from the exhaust will damage paint. Gaps, seams, hinges, and fairings are places exhaust gas deposits may be trapped.
5. The landing gear are the most exposed parts of the aircraft. Especially troublesome areas are:
   a. Magnesium wheels; around bolt heads, lugs, and wheel well areas.
   b. Exposed rigid tubing, B-nuts, ferrules; under clamps, and tubing identification tape.
6. Areas around flaps, flight control slots, and equipment installed in these areas may corrode due to erosive conditions.
7. Check frequently engine frontal areas, air inlet ducts, and wing leading edges, as they are constantly exposed to abrasion by dirt, dust, gravel, and rain.
8. Hinges (piano hinges especially) are vulnerable to corrosion.
9. Control cables may have bare spots in their preservative coating which will lead to corrosion. Cables having external corrosion must be checked for internal corrosion. Replace the cable if internal corrosion is present. If only external corrosion is present, remove corrosion with wire brush and coat cable with preservative.
10. Check and clean drain holes regularly.
11. Battery compartment and vent openings are prone to corrosion due to spilled electrolyte. Fumes from overheated battery electrolyte will spread to adjacent areas and cause rapid corrosion of unprotected surfaces. Frequent cleaning and neutralization of deposits will minimize corrosion.
12. Magnesium parts are prone to corrosion. Special attention must be given to their surface treat- ment, proper insulation (due to dissimilar metal corrosion), and paint coatings.
13. Electrical components and connectors must be checked. Inspection frequency is based on operational environment and past trouble.
14. Skin joints and lap-overs are areas that contain moisture. Corrosion in these areas may go unnoticed unless checked during inspection.
15. Hoses having an internal wire braid in a position where they are frequently water soaked, need a protective treatment.
16. Drilled holes and trimmed ends of sandwich panels must be protected. Use an inhibitor solution or sealant application. Any gaps or cavities which allow dirt or moisture to enter must be filled with sealant.

THIS PAGE INTENTIONALLY LEFT BLANK

PAINTING

A. PAINTING SAFETY

— WARNING —

Overspray from certain enamels, if put in water, is flammable. Store all overspray in covered containers away from buildings where spraying operations are conducted.

— WARNING —

Wash all rags and sponges used to apply any phosphoric acid conversion coatings (Alodine) before disposal. If material dries on rag, there is danger of spontaneous combustion.

— WARNING —

Mix dopes and lacquers with air drill. Do not use electric drill. Arcing electric drill motor will ignite fumes.

— WARNING —

Verify spray room is well ventilated. A concentration of fumes will cause a dangerous fire hazard or insufficient oxygen for the operator.

— CAUTION —

Do not allow paint stripper to contact fiberglass reinforced parts such as radomes, radio antennas, wing parts, or wing tips. Fiberglass structures may be finished with acrylic lac - quer or polyurethane enamel and are damaged by the stripper.

B. POLYURETHANE PAINT SAFETY

— WARNING —

Polyurethane paint may be dangerous to your health. Serious injury will result if safety precautions are not followed.

— WARNING —

During transit and storage check for signs of a bulging can, other than normal odor, or a change in resin from a clear to a cloudy state. A slow carbon dioxide buildup will cause can to burst. Remove and properly dispose any defective cans.

— WARNING —

Ensure adequate ventilation and wear appropriate breathing protection face mask when painting.

— WARNING —

Polyurethane paints can produce irritation of the skin, eyes, and respiratory tract during mixing and application. Exposure to spray vapors and mists during spray application may cause breathing difficulty, shortness of breath, and dry cough. Individual susceptibility is a controlling factor. Once sensi - tized, many people cannot tolerate any exposure and must thereafter avoid exposed work areas.

— WARNING —

Production type mixing and spray painting operations must be in specially designed, exhaust-ventilated areas.

— WARNING —

Painters must be fully clothed with collars buttoned and sleeves taped at the wrist. Painters must wear fitted, double cartridge organic vapor respirator with fresh cartridge inserted daily, solvent-resistant gauntlet style gloves, and safety goggles.

C. PAINT APPLICATION

— WARNING —

Ground aircraft before painting so no static electricity charges build up and discharge.

— CAUTION —

Protect windshield when masking aircraft. Paint strippers, metal brighteners, and solvents will damage windshield.

— CAUTION —

Balance movable control surfaces after painting. Refer to appropriate maintenance manual sections.

— CAUTION —

Before force drying at elevated temperatures, verify that all fuel tank vents are unobstructed and will not result in expanded fuel spilling on newly painted surfaces or paint booth floor.

— CAUTION —

Do not paint pitot tubes, gas caps, or antenna covers that were not factory painted.

— CAUTION —

Do not use metallic paints on radar cones or antenna covers.

— CAUTION —

Do not allow silicone lubricants to contact any surfaces to be painted. Silicone lubricant is very difficult to remove completely.

D. PAINTING SEQUENCE

For primer, tack, finish coats, and lacquer application:

1. Position airplane so airflow is from tail toward nose and overspray ahead of you.
2. To minimize overspray problems, have two painters work simultaneously on opposite sides of airplane.
3. Paint difficult areas such as landing gear, and wheel wells before flat surfaces. Paint the ends and leading edges of ailerons and flaps. Paint flap and aileron wells, wing tips, and leading and trailing edges.
4. Paint the bottom of the airplane first including bottom of horizontal tail surfaces. Starting at the root and working outward, spray chordwise. Work up fuselage and allow spray to cover sides. Work up to engine. Spray wing bottom. Start each painter at the root and work toward tip, spraying chordwise.
5. Lower airplane tail enough to reach fin top. When spraying fuselage top, tilt spray gun so overspray is ahead of area being painted and new paint will wipe out overspray. Spray primer across fuselage, vertical and horizontal tail surfaces, and wing.

E. COLOR MATCHING

— NOTE —

See aircraft logbooks for color codes.

F. TRIM AND REGISTRATION NUMBERS

Apply predominant color first over entire surface. Apply trim colors over base color after it dries. When top of fuselage is to be painted white with a dark color adjoining it, apply light color and feather into area to be painted with dark color. When light color dries, place masking tape and paper along separation line, and apply dark color.

Allow paint to dry several hours before removing masking tape. Remove tape by pulling slowly parallel to surface. This will reduce the possibility of peeling off finish with tape.

Apply registration numbers by painting or affixing self-adhering plastic figures. They must be solid color lines contrasting with background. Location and size of identification numbers vary, per aircraft size. Location and size is found in Federal Aviation Regulations.

G. PAINT SYSTEM COMPATIBILITY

Before applying new paint, find what type finish was used previously. Refer to the Piper parts catalog for correct paint number and color.

Identify paint finishes by applying engine oil to a small surface area. Old nitrocellulose finishes will soften in a few minutes. Acrylics, urethanes, and epoxy finishes show no effects.

If not identified, wipe down a small area with rag wet with methy ethyl ketone. MEK picks up pigments from acrylic finishes, but not from epoxy or cured urethane coatings. Wipe surface, do not rub. Heavy rubbing picks up epoxy and urethane pigments from coatings not fully cured.

The use of different types of paint, with several coatings, make repair of damaged and deteriorated areas difficult. Paint finishes are not always compatible. The following are general rules for compatibility and are not necessarily listed in order of importance.

1. Old type zinc chromate primer may be used directly for touchup of bare metal surfaces and on interior finishes. It may be overcoated with wash primers if in good condition. Acrylic lacquer finishes will not adhere to this material.
2. Modified zinc chromate primer will not adhere to bare metal. Never use it over a dried film of acrylic nitrocellulose lacquer.
3. Nitrocellulose coatings will adhere to acrylic finishes, but reverse is not true. Do not use acrylic nitrocellulose lacquers over old nitrocellulose finishes.
4. Acrylic nitrocellulose lacquers will not adhere to nitrocellulose and epoxy finishes and to bare metal. For best results, apply lacquers over fresh, successive coatings of wash primer and modified zinc chromate. They also adhere to freshly applied epoxy coatings (dried less than 6 hours).
5. Epoxy topcoats adhere to all paint systems in good condition. Use epoxy for general touch touchup, including touchup of defects in baked enamel coatings.
6. Old wash primer coats may be overcoated directly with epoxy finishes. Apply a new second coat of wash primer if an acrylic finish is to be applied.
7. Old acrylic finishes may be refinished with new acrylic provided old coating is thoroughly softened using acrylic nitrocellulose thinner before paint touchup.
8. Repair damage to epoxy finishes by using more epoxy. Neither lacquer finish will stick to epoxy surfaces. In some instances, air drying enamels may be used for touchup of epoxy coatings if edges of damaged areas are roughened with abrasive paper.

H. COMMON PAINT TROUBLES

1. Poor Adhesion - Paint properly applied to correctly pretreated surfaces will adhere satis- factorily. When thoroughly dry, paint must not be easily removed. Poor adhesion can result from:
   a. Inadequate cleaning and pretreatment.
   b. Inadequate stirring of paint or primer.
   c. Coating at incorrect time intervals.
   d. Application under adverse conditions.
   e. Bad application.
2. Spray Dust - Spray dust caused by atomized particles drying before reaching surface being painted fail to flow as a continuous film. Usual causes are incorrect air pressure or distance gun is held from work.
3. Sags and Runs - Excess paint causes wet paint film to move by gravity and presents a sagging appearance. Incorrect viscosity, air pressure, and gun handling, or inadequate surface prep- aration are frequent causes.

4. Spray Mottle - Sometimes known as orange peel or pebble, is caused by incorrect paint viscosity, air pressure, spray gun setting, or the distance the gun is held from work.
5. Blushing is one of the most common troubles. It appears as clouding or blooming of paint film. It is more common with cellulose than synthetic materials. It may be caused by moisture in air supply line, adverse humidity, drafts, or sudden temperature changes.

I. STORAGE

1. Store paint, enamel, and other finishing material in dry storage away from direct sunlight and heat. Mark each container with a code for identification.
2. Storage facilities must comply to Occupational Safety and Health Act (OSHA) requirements regarding air circulation, lighting, and fire protection. Lock storage facilities to prevent children and unauthorized personnel entry.
3. Invert pigmented materials every inventory so pigments will not pack to can bottom. Properly dispose of empty containers.
4. Use older materials first. Useful life of some finishes is limited.
5. Storage area temperatures must be approximately 50-90°F. If finishes are stored in temperature extremes, allow them to return to room temperature before using.

J. PAINTING FACILITY

— WARNING —

Do not breathe paint fumes. Fumes deplete the oxygen supply required by the body.

1. Painting facilities must conform to local, state, and OSHA standards with respect to air circulation, exhaust emissions, lighting, and fire protection.
2. Provide sufficient air movement in painting area so there is only a slight finishing material odor. Exhaust fans must be belt-driven and located near floor level. Locate fan's motor away from fumes.
3. All spraying area personnel must wear approved respiration safety equipment.

K. WAXING

1. Apply wax to aircraft exterior a minimum of ten days after last paint, enamel, or lacquer application.
2. Follow wax manufacturer's recommendation for preparation, application, and environ mental limitation. Air temperature in waxing area must be at least 60°F.
3. Polish waxed surfaces within two hours after application.
4. Wipe all laps, seams, and window collars in direction of seam to avoid wax buildup.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

21

ENVIRONMENTAL SYSTEM

1F18

CHAPTER 21 - ENVIRONMENTAL SYSTEM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
21-00-00	GENERAL	1F21	
21-40-00	HEATING	1F22	
21-40-00	Description and Operation	1F22	
21-40-00	Heater Maintenance	1F22	
21-50-00	COOLING	1G4	
21-50-00	Description and Operation	1G4	
21-50-00	Troubleshooting	1G4	
21-50-00	Malfunction Detection	1G12	
21-50-00	Systems Using Refrigerant R12 (Archer II)	1G12	
21-50-00	Systems Using Refrigerant HFC134a (Archer III)	1G12	
21-50-00	Special Servicing Procedures	1G14	
21-50-00	Service Valves	1G16	
21-50-00	Charging Station and Hand Manifold Set	1G17	
21-50-00	Evacuating System	1G19	
21-50-00	Using Robinair 34700	1G20	
21-50-00	Using A Hand Maniflid Set	1G22	
21-50-00	Leak Detection	1G23	
21-50-00	Using Robinair 34700	1G23	
21-50-00	Using A Hand Maniflid Set	1G23	
21-50-00	Discharging (Bleeding or Purging) System	1G24	
21-50-00	Charging The System	1H1	
21-50-00	Using Robinair 34700 Charging Stand	1H1	
21-50-00	Post Charging Operational Check	1H2	
21-50-00	Using Robinair 34700 Charging Stand	1H2	
21-50-00	Using A Hand Maniflid Set	1H3	
21-50-00	Component Service	1H4	
21-50-00	Compressor Service	1H4	
21-50-00	Compressor Removal	1H4	
21-50-00	Compressor Installation	1H5	
21-50-00	Checking Compressor Oil	1H6	
21-50-00	Replacement of Compressor Drive Belt	1H7	
21-50-00	Adjustment of Drive Belt Tension	1H10	
21-50-00	Magnetic Clutch	1H11	
21-50-00	Magnetic Clutch Removal	1H11	
21-50-00	Magnetic Clutch Installation	1H11	
21-50-00	Refrigerant Lines and Routing	1H12	

CHAPTER 21 - ENVIRONMENTAL SYSTEM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
21-50-00	COOLING (contd)	—	
21-50-00	Receiver-Dehydrator	1H12	
21-50-00	Receiver-Dehydrator Removal	1H12	
21-50-00	Receiver-Dehydrator Installation	1H12	
21-55-00	Condenser	1H13	
21-55-00	Condenser Removal	1H13	
21-55-00	Condenser Installation	1H13	
21-55-00	Condenser Door Actuator	1H13	
21-55-00	Condenser Assembly Rigging Instructions	1H13	
21-55-00	Expansion Valve	1H15	
21-55-00	Expansion Valve Removal	1H15	
21-55-00	Expansion Valve Installation	1H16	
21-55-00	Evaporator	1H16	
21-55-00	Evaporator Removal	1H16	
21-55-00	Evaporator Installation	1H16	
21-55-00	Pressure Relief Switch (Ranco)	1H18	
21-55-00	Electrical Installation	1H18	
21-55-00	Throttle Switch Adjustment	1H18	
21-55-00	Fuse Replacement	1H18	
21-80-00	CABIN VENT SYSTEM	1I1	
21-81-00	Overhead Vent System	1I1	
21-82-00	Overhead Vent Blower	1I1	
21-82-00	Overhead Vent Blower Description	1I1	
21-82-00	Blower Assembly Removal	1I1	
21-82-00	Disassembly of Blower Assembly	1I1	
21-82-00	Reassembly of Blower Assembly	1I1	
21-82-00	Installation Of Blower Assembly	1I2	

GENERAL

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

This chapter contains instructions for operating, servicing, inspecting, and repairing of environmental system components.

THIS SPACE INTENTIONALLY LEFT BLANK

HEATING

A. DESCRIPTION AND OPERATION

— WARNING —

Heat duct surface becomes hot when heat is on. Close contact with heat duct outlets will result in serious injury.

Heating system supplies warm air to cabin during winter and cool weather flights. System includes heat shroud, heat ducts, defroster outlets, and heat and defroster controls.

Fresh air is ducted from left engine baffle to heater muff which is attached to muffler. Heated air is ducted to valve box mounted on firewall. When valve opens, heated air enters heat ducts along each side of center console. Heat duct outlets are at each seat location. Controls in heat ducts regulate airflow to rear seats. Heater control on instrument panel right side regulates cabin temperature.

Aircraft defrosting is from heat outlets on right and left side of cowl cover. Heated air is ducted directly from heater valve box, to defroster shutoff valves at firewall, to defroster outlets. Defroster control below heat control regulates airflow.

Cabin air exhausts overboard by an outlet on bottom of fuselage aiding air distribution. Cabin exhaust outlets are below and outboard of rear seats.

B. HEATER MAINTENANCE (Refer to Figure 21-1.)

— WARNING —

Inspect exhaust manifold regularly. Defective exhaust manifold will cause carbon monoxide fumes in cabin area. (Refer to chapter 78.)

1. Remove heater muff to inspect manifold assembly.
2. Check operation of push-pull controls. Check valve doors function properly.
   a. With controls pulled out, door must open completely for full air flow.
   b. With controls pushed in, valves must close all air passages, and vent air into engine compartment.

THIS SPACE INTENTIONALLY LEFT BLANK

Island Enterprises

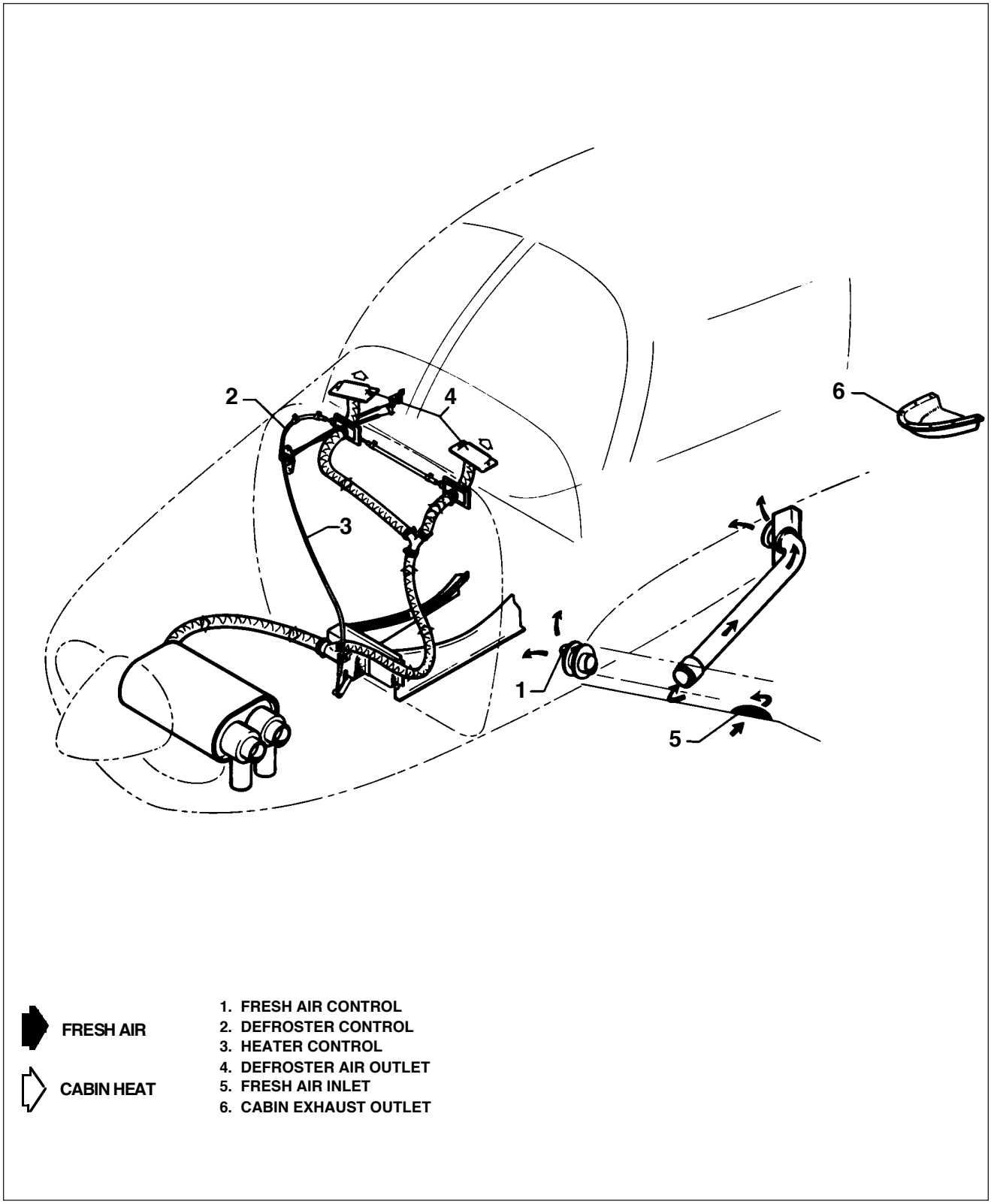


Figure 21-1. Cabin Heater, Defroster, and Fresh Air System (Archer II)

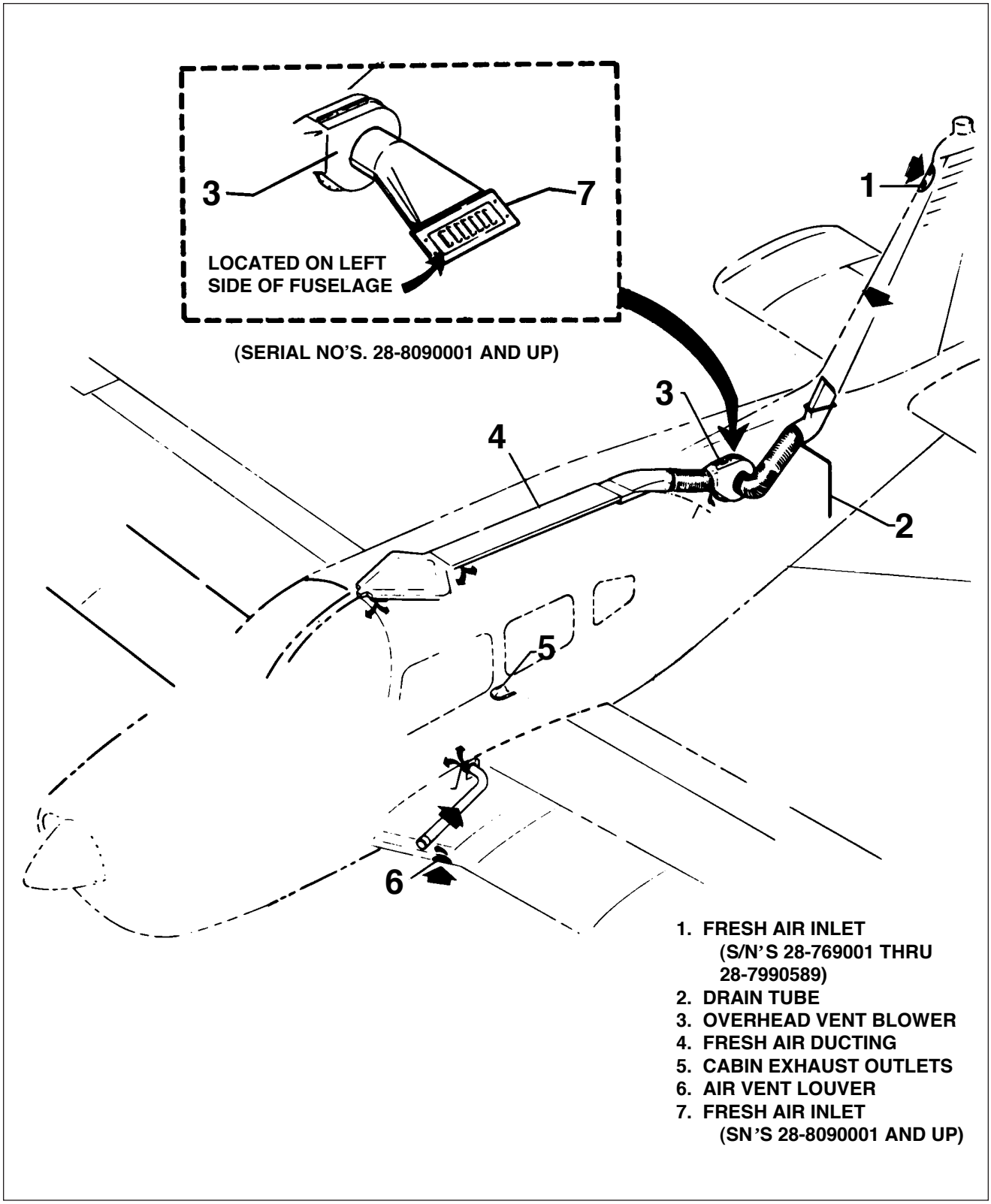


Figure 21-2. Overhead Vent System (Not Available With Air Conditioning) (Archer II)

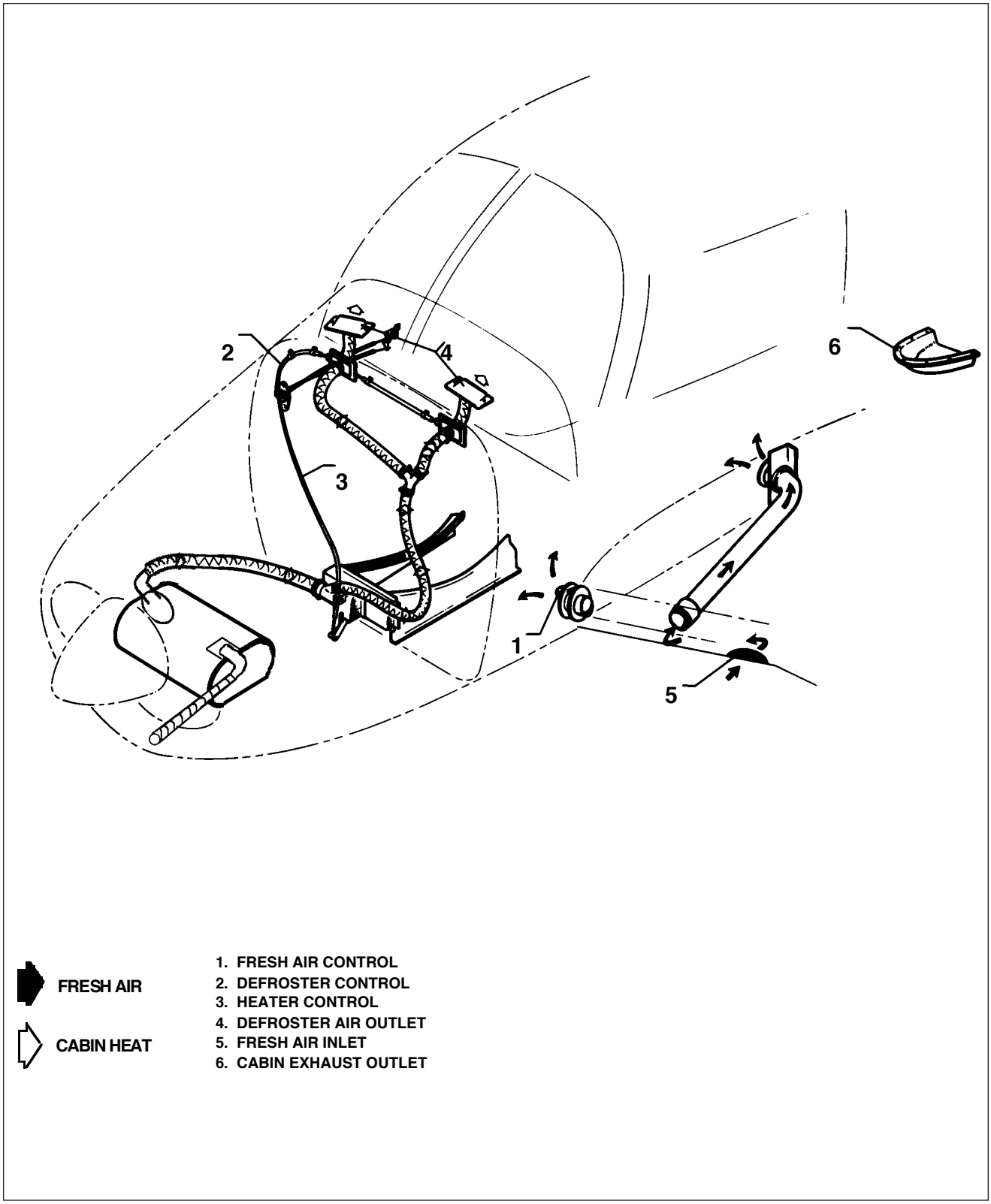


Figure 21-3. Cabin Heater, Defroster, and Fresh Air System (Archer III)

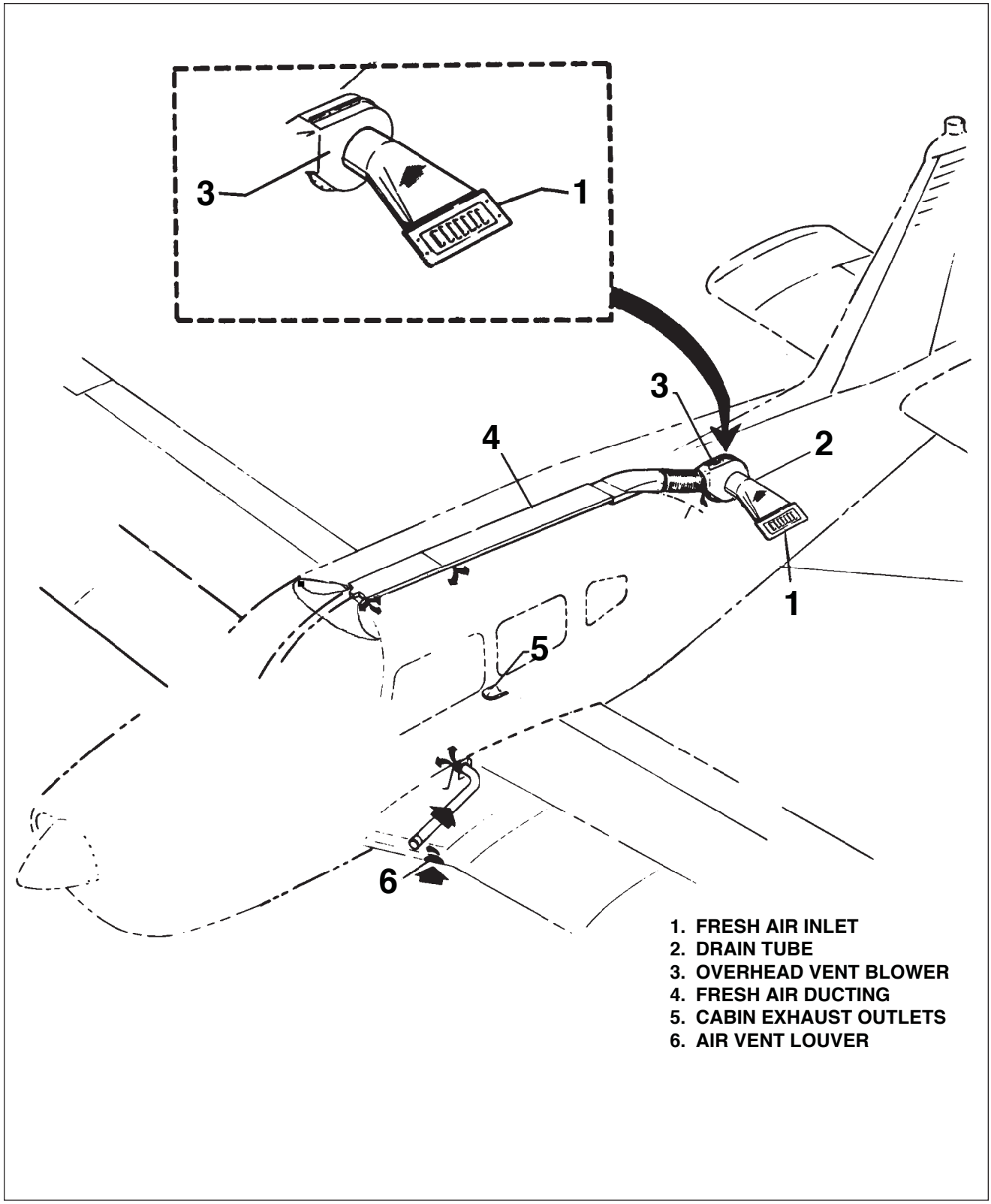


Figure 21-4. Overhead Vent System (Archer III)

THIS PAGE INTENTIONALLY LEFT BLANK

Island Enterprises

COOLING

A. DESCRIPTION AND OPERATION

— CAUTION —

Operate air conditioning system at least once a month to keep system lubricated and prevent sticking valves.

This installation consists of a compressor with its special bracketry, and an evaporator, condenser, receiver-dehydrator, circulating fan, thermal expansion valve, and related plumbing.

The evaporator filters, dehumidifies, and cools air. The evaporator is mounted in a fabricated housing with the receiver/dehydrator, circulating fan, thermal expansion valve, and related plumbing. The housing is in the rear cabin, aft of baggage area closeout panel. The compressor is a two cylinder, piston type supported by special bracketry at engine front. A V-belt connected to engine ring gear drives the compressor through a magnetic clutch. The condenser is on a hinge mounted door, on the bottom of the fuselage tail section. The condenser door is hinge mounted to allow extension into airstream during system operation. The condenser door is electrically activated to the system. When ON it is fully extended. When the system is OFF the door is fully retracted.

A Ranco type pressure switch protects the system and automatically controls condenser maximum head pressure by temporarily declutching the compressor if pressure becomes excessively high. The air conditioning control switch, a fan control switch to govern cold air velocity, and a temperature control are on aircraft instrument panel adjacent to heater and defroster levers.

System design does not increase aircraft drag during take-off. During maximum power demands the compressor is de-clutched and the condenser door automatically retracts.

The air conditioning system is a recirculating, independent unit. It filters, dehumidifies, and cools air as air cycles through evaporator. The unit operates from controls mounted on right side instrument panel. The air conditioning master switch has two positions, ON-OFF. If AIR COND position is selected, the compressor clutch engages, the condenser scoop opens, and the circulating fan is turned on. Temperature is controlled by temperature control selector thermostat. A three position fan switch (LOW-OFF-HIGH) operates the blower. The fan may be operated to circulate air without using air conditioning unit.

The air conditioning system originally installed in Archer II models uses refrigerant R12. The Archer III system uses HFC-134a refrigerant. Refrigerant enters the compressor as a vapor. The compressor pressurizes the heat laden vapor until the vapor temperature becomes warmer than the outside air temperature. The compressor then pumps the vapor to the condenser where the refrigerant is cooled and changes to liquid. The liquid now passes to the receiver/dehydrator. The receiver/dehydrator filter, removes moisture, and ensures a steady flow of liquid refrigerant into the evaporator through the expansion valve. The expansion valve is a temperature controlled metering valve which regulates the flow of liquid refrigerant to evaporator. The evaporator enables the liquid refrigerant to absorbs heat from the outside air passing over coils, converting it back to a vapor. From the evaporator, heat laden refrigerant in a vapor state returns to compressor, and the cycle repeats.

B. TROUBLESHOOTING

Troubles peculiar to air conditioner system components are listed in chart 2101, with probable causes, and suggested remedies. Correct trouble and check entire system for security and components operation.

The following definitions apply:

1. High Side: Consists of all lines and components between the compressor outlet and the expansion valve. It includes the condenser and receiver sight gauge.

2. Low Side: Consists of all lines and components between the expansion valve and the compressor inlet. It includes the evaporator.
3. Service Ports: Located on evaporator unit, and are used for evacuating and charging the system. The port in the short line between the receiver and the expansion valve is the high side service port. The other port, located nearby, is the low side service port.

   The Schrader valves used on the Archer II are threaded so that service hoses can be screwed onto them. When attached, a device inset into the service hose will depress and open the Schrader valve core.

   Service valves used on the Archer III are the quick disconnect type. The service hose couplers designed to be used in conjunction with this type of valve has a manually operated valve built into it. After attachment, the valve must be turned clockwise (in), in order to depress the Schrader valve spring and open it.

— NOTE —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2101. TROUBLESHOOTING AIR CONDITIONER (1 of 2)

GAUGE INDICATION	PROBABLE CAUSES	REMEDY
High discharge pressure.	Refrigerant overcharge.	Purge excess refrigerant.
	Air in system.	Check for leaks. Bleed charge from system. Evacuate and recharge system.
	Overheated condenser due to blocked air passage.	Clean bugs and dirt from condenser fins. Straighten bent fins.
	Flooded evaporator indicated by heavy frosting on suction line and compressor suction service valve.	Check capillary bulb is securely clamped to suction line. If capillary bulb ok replace expansion valve.
	Restriction in liquid line from condenser.	Check for kinked hoses and clogged filter.
Low discharge pressure.	Refrigerant undercharge.Sight glass shows bubbles or foam.	Add refrigerant until bubbles disappear. Check system leaks.
	Damaged compressor valves or dirt under valves.	Replace compressor.
	Damaged compressor. Worn or broken piston or piston rings.	Replace compressor.

— CAUTION —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2101. TROUBLESHOOTING AIR CONDITIONER (2 of 2)

GAUGE INDICATION	PROBABLE CAUSES	REMEDY
Low suction pressure. (Accompanied by icing evaporator.	Low air supply through evaporator) ducts. Very dirty evaporator fins and coils.	Repair blower or blower motor Clean stoppage in air Clean and flush with water. Add refrigerant. Install new dryer. Evacuate and charge.
Low suction pressure. (Evaporator not cold enough)Suction gauge reads vacuum indicating evaporator lacks refrigerant. High suction pressure.	Refrigerant undercharge. Moisture freezing in expansion valve. Valve shows frost. Expansion valve inlet screen clogged. Inoperative expansion valve. Valve stuck closed or capillary bulb has lost charge. Restriction in liquid line. Restriction will show frost. Capillary bulb clamp loose on suction line. Suction line shows frost. Expansion valve not closing. Evaporator flooded. Suction line frosted to compressor. Compressor drive belt slipping. Magnetic clutch slipping. Leaking or broken compressor.	Remove screen. Clean with solvent and replace. Warm capillary by holding in hand. If suction pressure does not charge, replace expansion valve. Locate restriction and repair. Clean contact surfaces of suction line and cap bulb. Tighten clamp. Replace expansion valve. Adjust belt tension. Check electrical circuit for proper voltage to clutch coil. Clean oily clutch surfaces. Replace compressor valves.

— CAUTION —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2102. TROUBLESHOOTING AIR CONDITIONING SYSTEM (1 of 4)

TROUBLE	CAUSE	REMEDY
Condenser door will not close when air conditioner switch is in OFF position.	Faulty K-2 relay.	Replace relay.
System does not cool.	**Electrical**	
	Blown fuse in control head.	Replace fuse.
	Open circuit breaker.	Set circuit breaker.
	Broken or disconnected electrical wire.	Check all terminals for loose connections. Check wiring for hidden breaks.
	Broken or disconnected ground wire.	Check ground wire is not loose, broken, or disconnected.
	Clutch coil burned out or disconnected.	Check current flow to clutch. Replace if inoperative.
	Thermostat sensing element defective.	Check thermostat and cabin comfort control panel.
	Blower motor disconnected or burned out.motor.	Check current flow to blower Repair or replace if inoperative.
	Mechanical	
	Loose or broken drive belt.	Replace drive belts and tighten to specifications.
	Compressor partially orcompletely frozen.	Remove compressor. Service or replace.
	Expansion valve stuck inopen position.	Replace expansion valve.

— CAUTION —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2102. TROUBLESHOOTING AIR CONDITIONING SYSTEM (2 of 4)

TROUBLE	CAUSE	REMEDY
System does not cool.	**Refrigeration**	
	Broken refrigerant line.	Examine all lines for evidence of breakage by external stress or rubbing wear.
	Leak in system.	Evacuate system, apply static charge, leak test system, and repair leak as necessary.
	Compressor shaft seal leaking.	Replace compressor.
	Clogged screen or screens in receiver dehydrator or expansion valve; plugged hose or coil.	Repair as necessary.
System cooling inadequate.	**Electrical**	
	Blower motor operation sluggish	Remove blower motor for service or replacement.
	Mechanical	
	Compressor clutch slipping.	Remove clutch assembly for service or replacement.
	Obstructed blower passage.	Examine entire passage for obstruction. Correct as necessary.
	Insufficient air circulation over condenser coils; fins clogged with dirt or bugs.	Clean condenser coils.
	Clogged evaporator filter.	Clean with cleaning solvent to remove cigarette tars.

— CAUTION —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2102. TROUBLESHOOTING AIR CONDITIONING SYSTEM (3 of 4)

TROUBLE.	CAUSE	REMEDY
System cooling inadequate.	**Refrigeration**	
	System refrigerant low.	Recharge system until bubbles disappear in receiver dehydrator and gauge readings stabilize to specifications.
	Clogged screen in expansion valve.	Purge system, replace expansion valve.
	Expansion valve thermal bulb has no charge.	Purge system, replace expansion valve.
	Clogged receiver dehydrator screen.	Purge system, replace receiver dehydrator.
		Purge system, replace receiver dehydrator.
	Excessive moisture in system. Air in system.	Purge, evacuate, and charge system. (Replace receiver dehydrator.)
Excessively noisy system.	**Electrical**	
	Defective winding or improper connection in compressor clutch coil.	Replace or repair as necessary.
	Mechanical	
	Loose or excessively worn drive belts.	Tighten or replace as required.
	Noisy clutch.	Remove clutch for service or replacement.

— CAUTION —

United States environmental regulations require use of a collection system when necessary to evacuate refrigerant from air conditioner.

— NOTE —

Check all environmental regulations for your local area before servicing air conditioning system

CHART 2102. TROUBLESHOOTING AIR CONDITIONING SYSTEM (4 of 4)

TROUBLE	CAUSE	REMEDY
Excessively noisy system.	**Mechanical**	
	Compressor noisy.	Check mountings and repair. Remove compressor for service or replacement.
	Compressor oil level low.	Fill with proper amount of specified oil.
	Refrigeration	
	Excessive system charge.	Remove excess Freon until high pressure gauge drops within specifications.
	Low system charge.	Check system for leaks. Charge system.
	Excessive moisture insystem.	Replace dehydrator, purge, evacuate, and charge system.

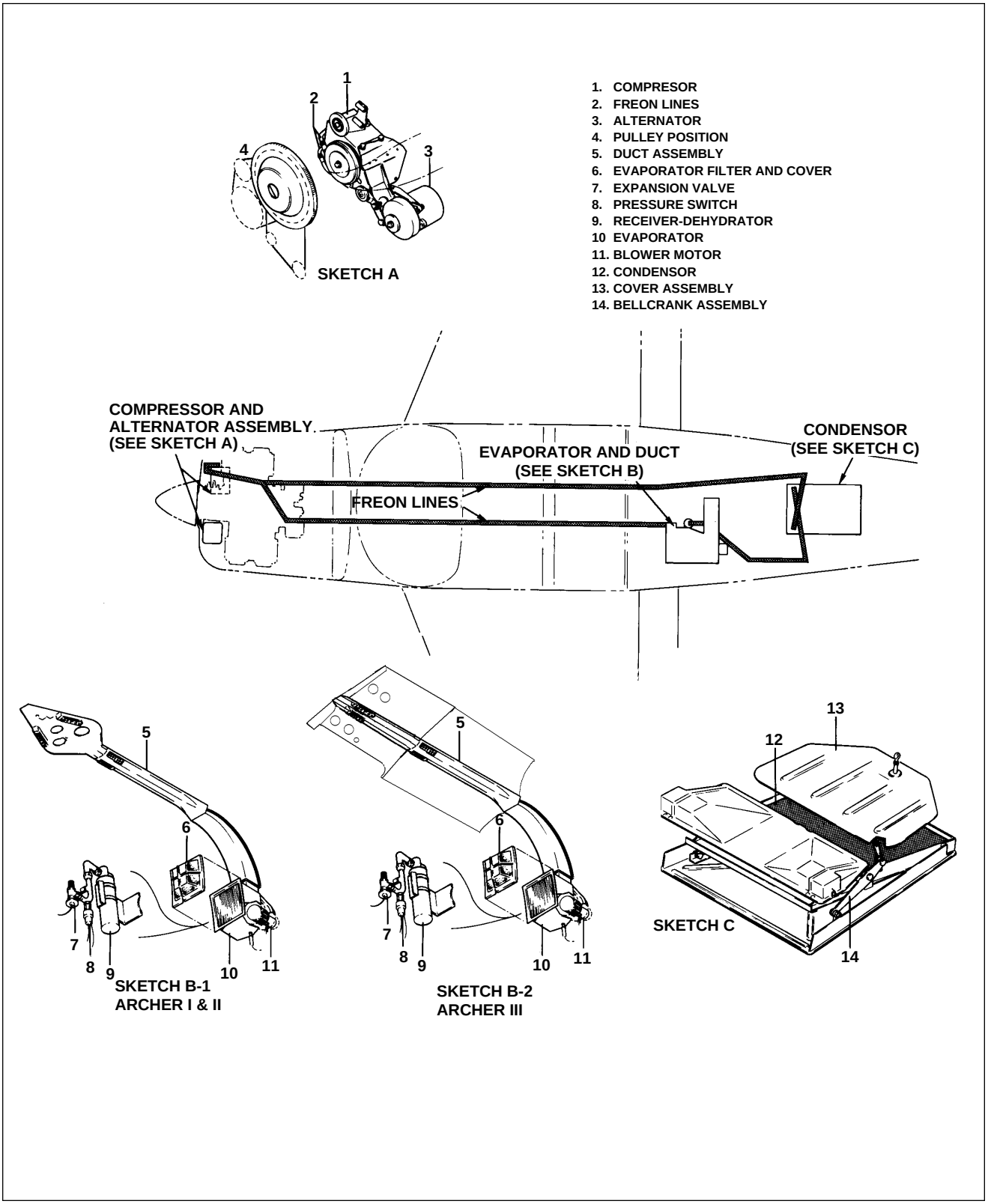


Figure 21-5. Air Conditioning System Installation (Typical)

C. MALFUNCTION DETECTION

Detection of system malfunctions largely depends on the mechanic's ability to interpret gauge pressure readings into system problems. A system operating normally will have low side gauge pressure reading that will correspond with the temperature of the refrigerant evaporating, allowing for a few degrees temperature rise due to loss in tube walls and fins. The high side will have a gauge pressure that will corresponds with the temperature of the refrigerant condensing in the condenser, allowing for a few degrees temperature drop due to loss in tube walls and fins.

Any deviation from that which is normal indicates a malfunction within the system due to faulty control device, obstruction, defective part, or improper installation.

Early detection and repair saves time and prevents additional complications.

System performance tests verify efficient systems operation. Whenever possible, the air conditioning system should be given this test before work is begun on it. However, if system is completely inoperative, repairs must be performed before system can be properly tested. Performance tests should always be performed after repair work has been done and before the aircraft is returned to service. Careful testing ensures proper repairs have been accomplished and that the system is operating satisfactorily.

Performance tests include thorough outside and inside examination. Perform a thorough visual inspection of the complete system, followed by an operating inspection of the system.

1. Systems Using Refrigerant R12 (Archer II)

Detection of system malfunction is made easier with the knowledge that temperature and pressure of refrigerant R12 is in close proximity between the pressures of 20 and 60 psi. A glance at the pressure-temperature chart will show that there is only a slight variation between the temperature and pressure of the refrigerant in the lower range. Refer to Chart 2103 for exact values.

It is correct to assume that for every pound of pressure added to the low side, a temperature increase of about one degree Fahrenheit takes place. For instance, a pressure of 23.8 on the chart indicates a temperature of 24°F. A change of pressure of almost one pound to 24.6 psi gives a temperature increase to 25°F.

— NOTE —

Gauge readings are about one inch mercury or 1/2 psi higher than chart reads for each 1000 feet elevation above sea level.

Actual air temperature of air passing over the evaporator coils will be several degrees warmer allowing for a temperature rise caused by the loss in the fins and tubing of the evaporator.

2. Systems Using Refrigerant HFC134a (Archer III)

Detection of system malfunction is made easier with knowledge of the relationship between temperature and pressure of refrigerant HFC134. Refer to Chart 2103 for specfic values.

— NOTE —

Gauge readings are about one inch mercury or 1/2 psi higher than chart reads for each 1000 feet elevation above sea level.

Actual air temperature of air passing over the evaporator coils will be several degrees warmer allowing for a temperature rise caused by the loss in the fins and tubing of the evaporator.

CHART 2103. REFRIGFERANT TEMPERATURE PRESSURE

Refigerant R12 Evaporator Pressure Gauge Reading psi	Refigerant R12 Evaporator Temperature °F	Refigerant HFC134a Evaporator Pressure Gauge Reading psi	Refigerant HFC134a Evaporator Temperature °F
0	-21	5	-27
2.4	-15	0	-15
4.5	-10	2	-9
10.1	2	4	-4
11.2	4	6	0
12.3	6	8	4
13.4	8	10	7
14.6	10	12	11
15.8	12	14	14
17.1	14	16	17
18.3	16	18	20
19.7	18	20	22
21	20	22	25
22.4	22	24	28
23.1	23	26	30
23.8	24	28	33
24.6	25	30	35
25.3	26	32	37
26.1	27	34	39
26.8	28	36	41
27.6	29	38	43
28.4	30	40	45
29.2	31	42	47
30	32	44	49
30.9	33	46	51
31.7	34	48	53
32.5	35	50	54
33.4	36	55	58
34.3	37	60	62
35.1	38	65	66
36	39	70	69
36.9	40		
37.9	41		
38.8	42		
39.7	43		
41.7	45	**THIS SPACE INTENTIONALLY LEFT BLANK**	**THIS SPACE INTENTIONALLY LEFT BLANK**
43.6	47		
45.6	49		
48.7	52		
49.8	53		
55.4	57		
60	62		
64.9	66		

D. SPECIAL SERVICING PROCEDURES

NOTE

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when testing, discharging, or charging the system.

United States federal environmental regulations require that air conditioning system repairs be accomplished by a qualified shop with appropriately trained personnel.

System efficiency depends upon the pressure-temperature relationship of pure refrigerant. If the system contains only the appropriate pure refrigerant (R34 or HFC134a), plus a specified amount of the appropriate compressor oil (mixed with refrigerant), it is considered chemically stable. Foreign materials within system affects chemical stability, contaminates the system, and decreases efficiency.

— WARNING —

Air conditioning refrigerant (both R12 or R134a) is odorless and colorless in either its liquid or gaseous state. Both R12 and HFC134a, used for charging refrigeration systems, are in a pressurized container (approx. 70 psi at 70°F) in liquid form. Both refrigerants are inert at room temperature. The pressure and refrigeration effects of release and evaporation of the pressurized liquid is dangerous.

—WARNING —

Wear suitable eye protection when handling refrigerants. The eye will freeze if contacted by escaping liquid refrigerant.

If liquid refrigerant contacts eye:

1. DO NOT RUB THE EYE.
2. Splash large quantities of cool water into eye to raise temperature.
3. Apply eye patch to avoid possibility of dirt entering eye.
4. Rush to physician or hospital for immediate medical care.
5. DO NOT ATTEMPT TO TREAT YOURSELF.

— WARNING —=

Liquid refrigerant on the skin will cause frostbite. Treat with cool water and protect with petroleum jelly. Seek medical attention.

— WARNING —

Use care not to discharge refrigerant into a closed room. Refrigerant displaces air in the room and causes oxygen starvation. Gaseous refrigerant is heavier than air and flows to container bottom.

— WARNING —

Use care not to discharge refrigerant into an open flame or onto a very hot surface (500°F). Poisonous phosgene gas is generated by heat action on the refrigerant.

— WARNING —

Do not apply direct flame or other high heat source to a refrigerant container, because high pressures result. If heating refrigerant containers, container pressure must be monitored and kept below 150 psi.

— WARNING —

Discharge systems slowly to prevent escape of liquid refrigerant and loss of lubricating oil. Read and follow all instructions provided by manufacturer of equipment used for discharging system.

— WARNING —

Do not let air conditioning systems open to the atmosphere when discharged. Moisture and other contaminates will enter and damage open systems.

— WARNING —

Never add anything but pure R12 or HFC134a refrigerant, as appropriate, and appropriate refrigerant oil (mineral oil or polyalkylene-glycol) into system.

— WARNING —

Keep refrigerant oil containers tightly sealed and clean to prevent absorption of moisture or other contamination.

— WARNING —

Use only approved refrigeration oil in compressor (mineral oil or polyalkylene-glycol). Replace with new oil if in doubt about compressor oil cleanliness..

— WARNING —

Do not reuse oil removed from the system. Properly dispose of it.

— WARNING —

Heat joint to 400°F before disassembly if Loctite Refrigerant Sealant was used. Use Loctite to seal any system line pipe threads.

— WARNING —

When R-12 Refrigerant contact with moisture it forms a very strong acid (HCl).

— CAUTION —

Replace receiver dehydrator assembly on any system operating with a leak allowing air to enter system. Receiver dehydrator left open to the atmosphere must be replaced due to loss of effectiveness of the drying compound it contains.

— CAUTION —

New receiver dehydrator must be opened and connected to system only when ready to charge system with refrigerant.

— CAUTION —

Use recommended torque values on all flare fitting and O-ring joints. (See chart 2105.)

CHART 2104. ALUMINUM TUBING TORQUE (Archer II)

Metal Tube O. D.	Thread and Fitting Size	Aluminum. Tubing Torque
1/4	7/16	5-7 ft. lbs.
3/8	5//8	11-13 ft. lbs.
1/2	3/4	15- 20 ft. lbs.
5/8	7/8	21-17 ft. lbs.
3/4	1-1/16	28-33 ft. lbs.

CHART 2105. RECOMMENDED TORQUE SPECIFICATIONS (ARCHER III)

FLARE CONNECTION			O-RING CONNECTIONS		
Tube O. D.	Thread Size	Ft./Lbs.	Tube O. D.	Thread Size	Ft./Lbs.
3/8	5/8	18-20	3/8	5/8	11-13
1/2	3/4	36-39	1/2	3/4	15-20
5/8	7/8	52-57	5/8	7/8	21-27

1. Service Valves

— CAUTION —

Service valves located on compressor are not recommended for normal servicing. (Applicable to Archer II only; Archer III has no service valves on compressor.)

— CAUTION —

Replace core assembly if Schrader valve is not serviceable.

— CAUTION —

If air conditioning refrigerant lines or system is opened, lines and fittings must be CAPPED and sealed immediately to prevent dirt and other contaminants from entering the system. (DO NOT put a PLUG into the hoses or fittings.)

Use service valves to service air conditioning system (testing, bleeding, evacuating, and charging). The aircraft is equipped with service valves mounted in the suction and discharge lines of the evaporator assembly located behind rear close-out panel. Valves used on the Archer II airplanes are two-position screw-on type Schrader valves. Valves used on the Archer III are the quick disconnect type Schrader valves. These valves should be used for all normal air conditioning service.

Valves on the compressor used on Archer II models are sealed with a gasket in the valve port boss and should ***not*** be used to service the system.. Lubricate gasket with tube fitting facing aft and secure with 0.312 bolts; tighten to a torque of 15 to 23 inch pounds.

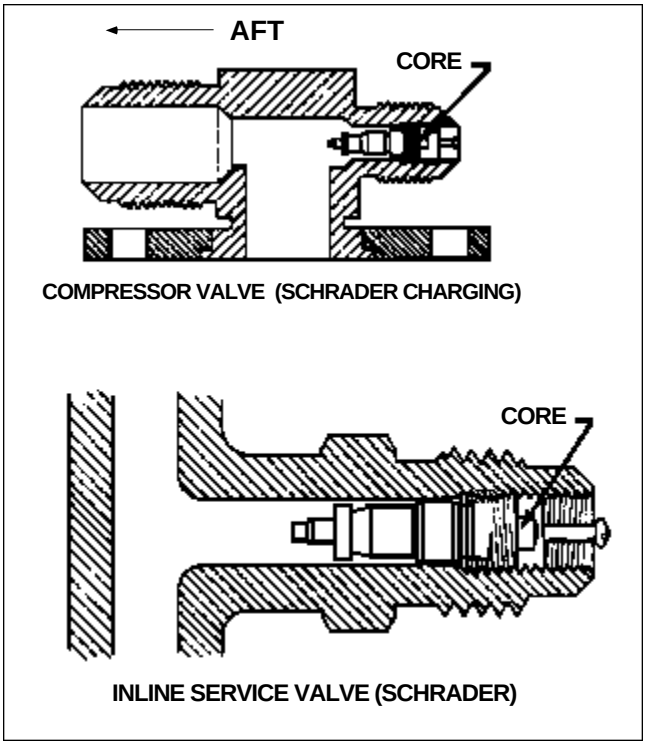


Figure 21-6. Service Valves - Archer II
(Sheet 1 of 2)

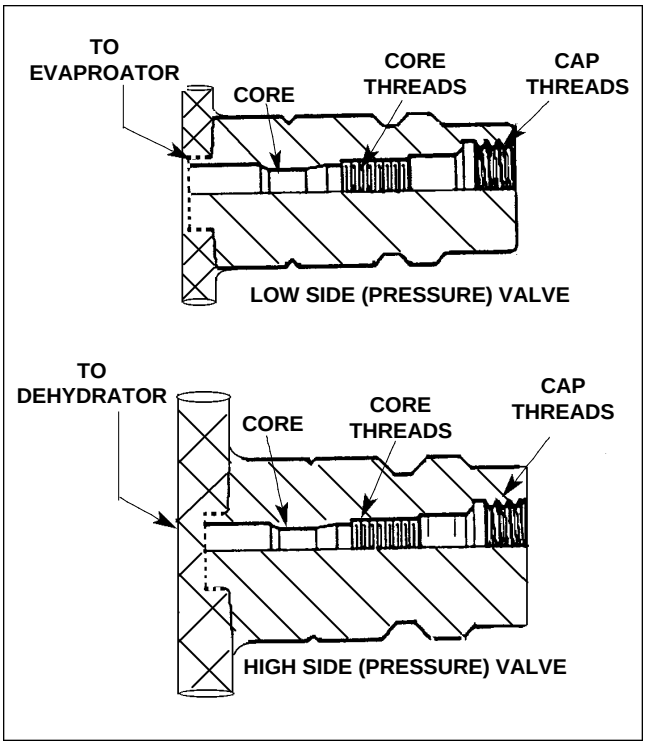


Figure 21-6. Service Valves - Archer III
(Sheet 2 of 2)

2. Charging Station And Hand Manifold Set

NOTE

United States environmental regulations prohibit the intentional release of refrigerant into the atmosphere.

United States environmental regulations require that an approved charging station be used when servicing any air conditioning system. The following text, describing the use of a charging station, is in reference to the Robinair 34700 and should be augmented by reference to the instructions supplied by Robinair. This does not imply that Piper Aircraft specifically recommends the use of the Robinair 34700. Refer to the instructions supplied by the manufacturer if another brand of station is employed.

The Archer II utilizes R12 refrigerant, which uses mineral oil as a lubricant. The service valves are threaded screw-on type. The Archer III utilizes HFC134a refrigerant, which uses polyalkylene-glycol (P.A.G.) as a lubricant. The service valves are quick disconnect type. Because mineral oil and P.A.G. are not compatible, a separate manifold test set and/or test stand must be used for each system.

Proper testing and diagnosis of air conditioning system requires a manifold gauge set and/or an appropriate test stand be attached to system. The manifold gauge set comprises a high pressure gauge in the discharge side of the the system and a low pressure gauge in the suction side of the system. The manifold has fittings for both gauges and hose connections for controlling refrigerant flow through manifold. (See Figures 21-7 and 21-8.) The center port of the manifold set is connected to the charging station for evacuating, charging, and servicing the system.

When a manifold set is used in conjunction with a test stand, the test stand low and high pressure valves must be in the OPEN position. Both the high and low side of the manifold set have hand shutoff valves, which are used to control flow with in the system. When a given hand valve is turned clockwise all the way in it closes that particular manifold section. Pressures on that side of system will, however, be recorded on the gauge above the hose. Refer to Figure 21-9 for connecting manifold to the charging/test stand

Turning either hand valve counterclockwise opens the system to the middle service port of the manifold set. This is desirable only when necessary to let refrigerant out of or into system. (Refer to Figures 21-7 and 21-8.)

When using only the charging cart/test stand all flow is controlled by the valves on the stand.

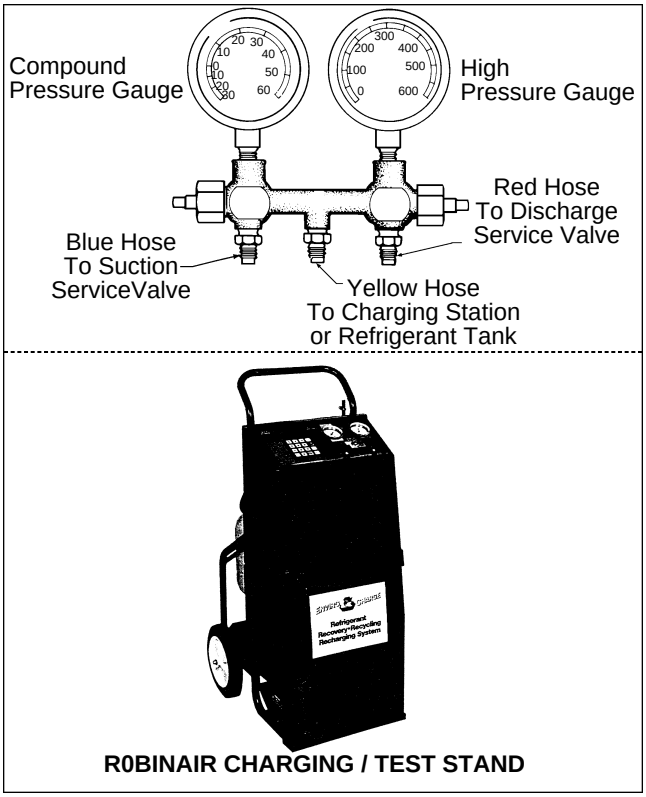


Figure 21-7. Test Manifold and Charging Cart

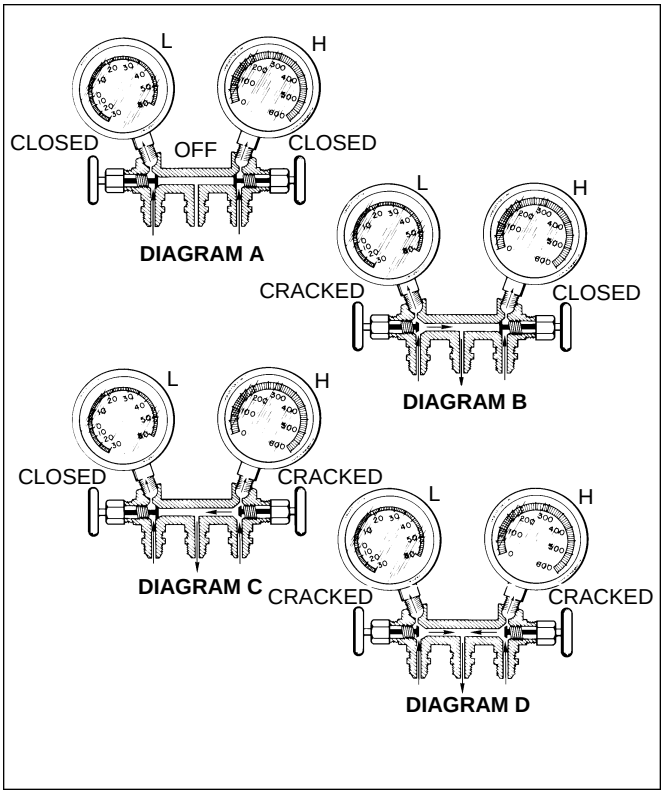


Figure 21-8. Manifold Set Operation

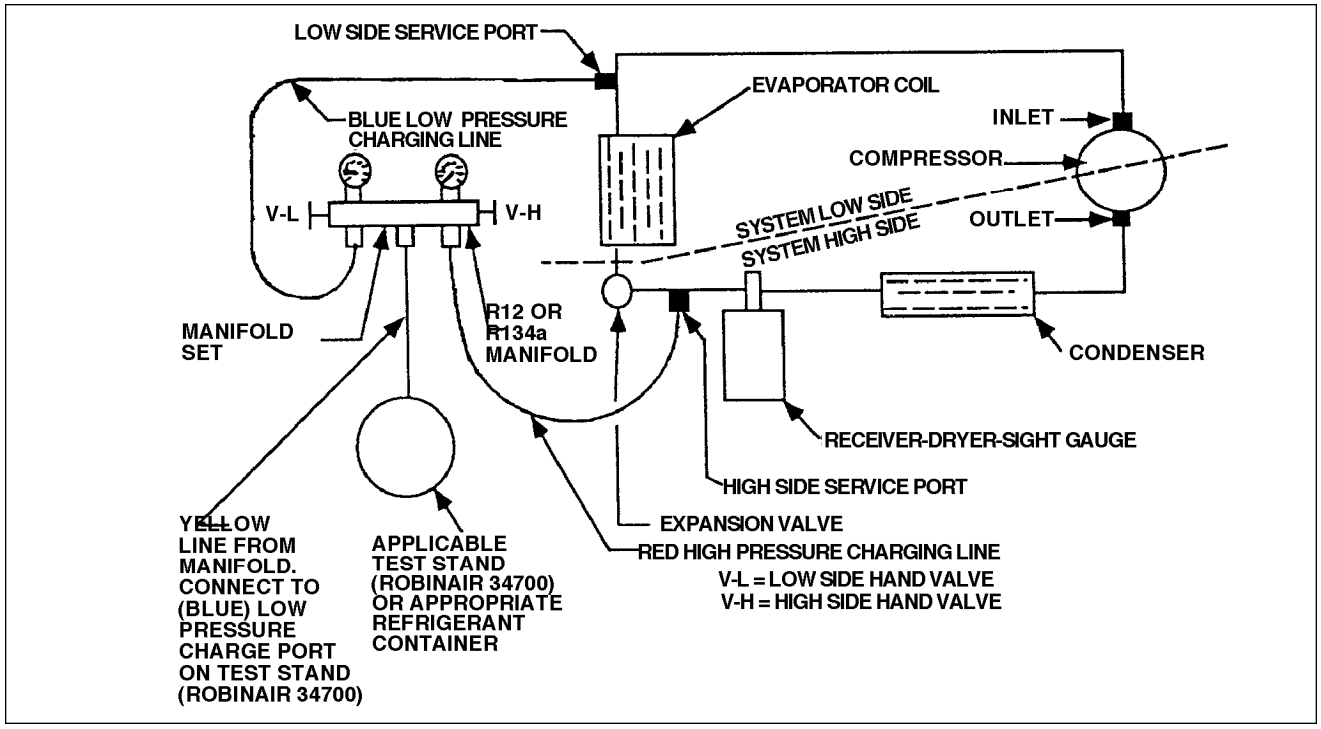


Figure 21-9. Manifold to Recharging/Test Stand Hookup

3. Evacuating The System

— CAUTION —

Evacuate system before leak check.

If system is operated in a discharged condition, or has been open to atmospheric pressure, the receiver/dehydrator must be replaced, and the system evacuated to remove non-condensible gases and any trapped moisture from within the system. Use the Robinair or comparable charging/test stand to evacuate system. Water in vapor form will be pulled from system as lower pressure and lower water boiling temperatures occur. Chart 2105 shows the temperature at which water will vaporize at various vacuum (negative) pressures.

CHART 2106 SYSTEM VACUUM

	System Vacuum	Temperature °F
COMPOUND GAUGE READING IN INCHES OF MERCURY VACUUM	27.95	101
	28.74	84
	29.53	52
	29.76	29
	29.84	15
	29.88	1

— NOTE —

Compound gauge reading will be approximately one inch lower, numerically, each 1000 feet elevation above sea level.

a. Using the Robinair 34700 (Refer to Figures 21-10 and 21-11)

(1) Remove access panel at rear of cabin to gain access to service valves.
(2) Remove protective caps from the high and low side service ports on the evaporator unit.
(3) Close both the low side and high side valves on charging unit. Refer to Figure 21-10

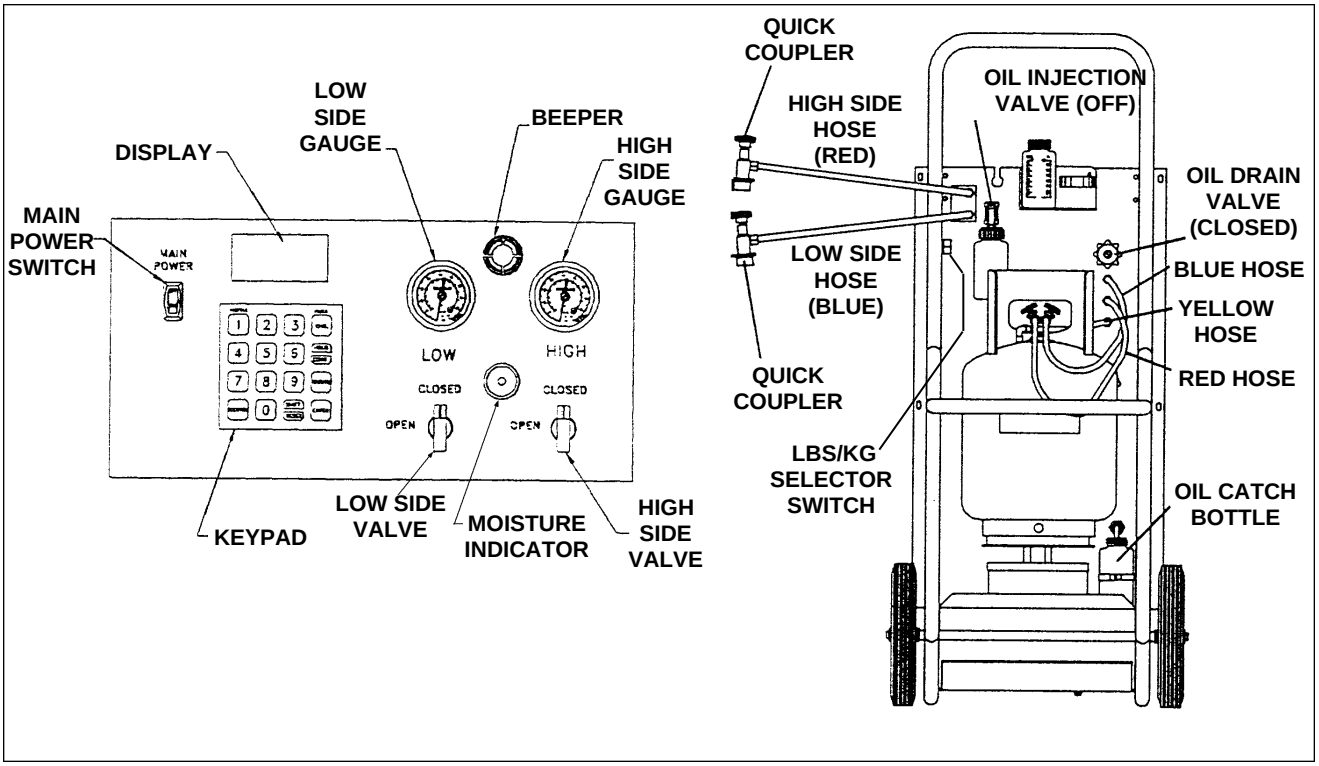


Figure 21-10. Robinair 34700 Control Panel and Hose Connections

(4) Connect the blue and red hoses to the service ports as shown in Figure 21-11. On systems equipped with quick disconnect connections, open coupler valves
(5) Open blue (low side) valve (1) on unit's control panel
(6) Open both the red GAS (vapor) valve and the blue LIQUID valve on the ***tank***. (Refer to Figure 21-10.)
(7) Program the length of evacuation time.
  (a) Press the VACUUM key on control panel key pad.
  (b) Display will show unit is in VACUUM mode.
  (c) Refer to operator's manual for further detail.
(8) Enter the required time in minutes and seconds (30:00 minutes minimum) by pressing appropriate keys and then ENTER on keypad. The display will show selected time in ***minutes and seconds***. Example: one hour and fifteen minutes (1:15) would be entered as 7500. The display will show 75:00. Thirty minutes is entered as 3000. the display will show 30:00.
(9) To start the vacuum pump press the VACUUM key on keypad again.
(10) Vacuum sequence will continue for the programmed time. Digital display will then show CPL, indicating that the evacuation is completed.
(11) If, after 5 minutes of pump operation, the RED gauge does not indicate a little below zero:
  (a) Stop the pump by pressing the 1 key or the SHFT/RESET key.
  (b) Eliminate blockage in the system by replacing faulty parts.
  (c) Repeat steps (1) through (8) above.

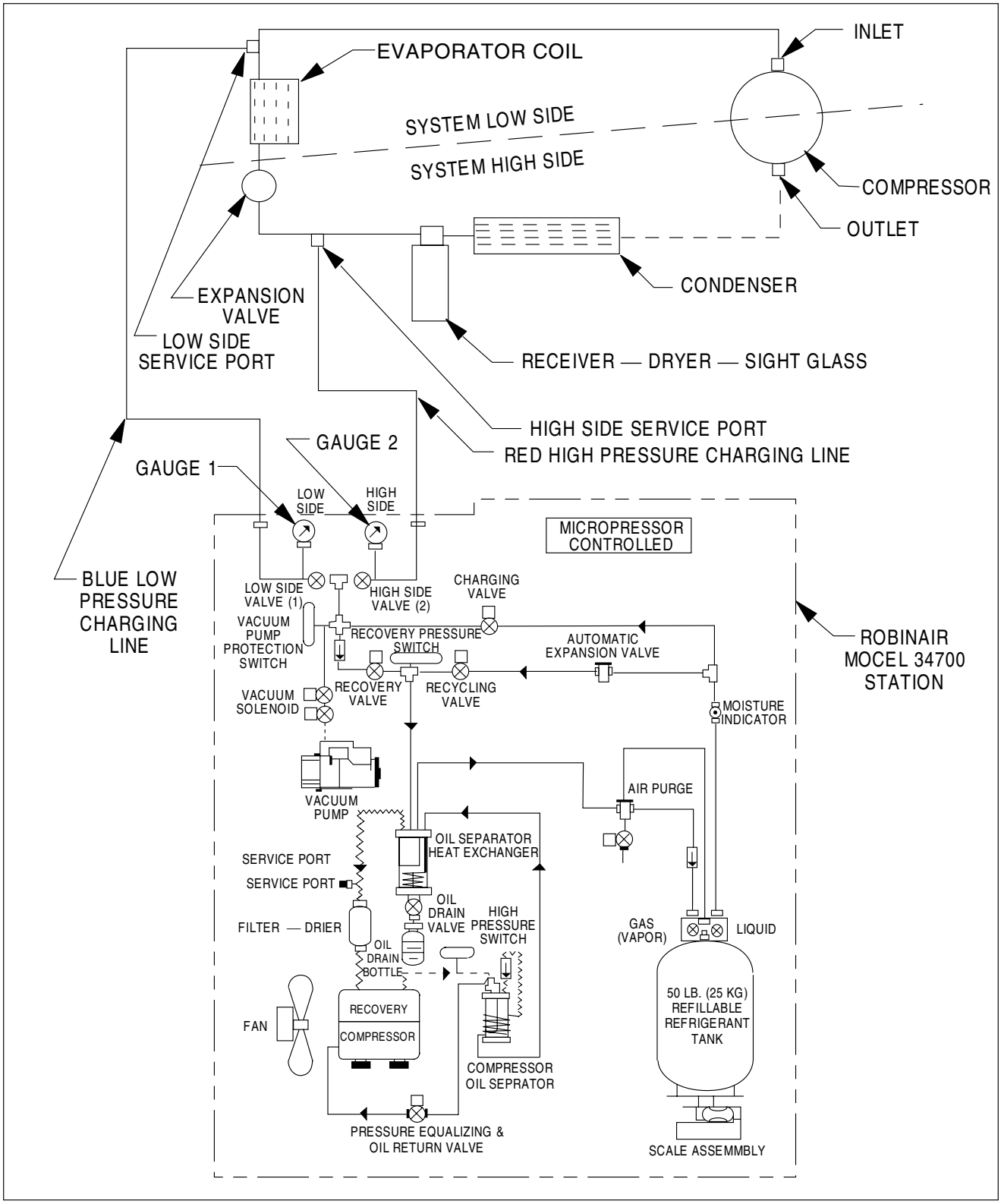


Figure 21-11. Robinair 34700 Hose Hookup

(12) When RED gauge indicated a little below zero, open red (high side) valve (2), and continue evacuation.
(13) Operate vacuum pump for 0:15 minutes, or until low side gauge (GAUGE 1) indicates 24 to 26 inches of mercury (in. Hg.), whichever occurs first.
(14) Close low side (1) and high side (2) valves.
(15) Stop vacuum pump and observe low side gauge (GAUGE 1). If gauge rises at a rate greater than 1 in. Hg. in 0:05 minutes. there is a leak in the system. Locate leak as described in paragraph 4, Leak Detection.
(16) Repair leak. Repeat steps (1) through (15). as necessary.
(17) With the low side (1) and high side (2) valves OPEN, continue pumping, holding system below 26 in. Hg. for a minimum of 30 minutes.

— NOTE —

All specified pumping times may be included in the 0:30 minutes, provided no blockage or leaks ore noted, and provided the system is not opened by disconnecting or removing components.

(18) When panel display reads CPL (complete), close both the low side valve (1) and the high side (2) valves.. Perform charging procedure immediately. (Refer to paragraph 6)

b. Using A Hand Manifold Set

(1) Remove access panel at rear of cabin to gain access to service valves.
(2) Remove protective caps from the high and low side service ports on the evaporator unit.
(3) Disconnect small end of blue hose from low side port of Robinair charging/test stand. Connect yellow manifold hose to units low side port. See manufacturer's instructions for other model charging/test stands. (Refer to Figure 10)
(4) Check that all valves on manifold and test stand are closed. Connect manifold hoses to service valves. On systems equipped with quick disconnect connections, open coupler valves. (Refer to Figure 9.)
(5) OPEN Low side valve on ***recharging/test stand.***
(6) Open both the red GAS (vapor) valve and the blue LIQUID valve on the ***tank***.
(7) Program the length of evacuation time.
  (a) Press the VACUUM key on control panel key pad.
  (b) Display will show unit is in VACUUM mode.
  (c) Refer to operator's manual for further detail.
(8) Enter the required time in minutes and seconds (30:00 minutes minimum) by pressing appropriate keys and then ENTER on keypad. The display will show selected time in ***minutes and seconds***. Example: one hour and fifteen minutes (1:15) would be entered as 7500. The display will show 75:00. Thirty minutes is entered as 3000. the display will show 30:00.
(9) OPEN the ***low*** side ***manifold hand set*** valve.
(10) To start the vacuum pump press the VACUUM key on keypad again.
(11) Vacuum sequence will continue for the programmed time. Digital display will then show CPL, indicating that the evacuation is completed.
(12) If, after 5 minutes of pump operation, the ***high*** side ***manifold hand set*** gauge does not indicate a little below zero:
  (a) Stop the pump by pressing the 1 key or the SHFT/RESET key.
  (b) Eliminate blockage in the system by replacing faulty parts.
  (c) Repeat steps (7) through (10) above.

(13) When ***High*** side ***manifold hand set*** gauge indicates a little below zero, open ***High*** side ***manifold*** hand set valve and continue evacuation.
(14) Operate vacuum pump for 0:15 minutes, or until ***manifold hand set low*** side gauge indicates 24 to 26 inches of mercury (in. Hg.), whichever occurs first.
(15) Close ***manifold hand set low*** side and ***high*** side valves.
(16) Stop vacuum pump and observe ***manifold hand set low*** side gauge. If gauge rises at a rate greater than 1 in. Hg. in 0:05 minutes. there is a leak in the system. Locate leak as described in paragraph 4, Leak Detection.
(17) Repair leak. Repeat steps (7) through (15). as necessary.
(18) With the ***manifold hand set low*** side and ***high*** side valves OPEN, continue pumping, holding system below 26 in. Hg. for a minimum of 30 minutes.

— NOTE —

All specified pumping times may be included in the 0:30 minutes, provided no blockage or leaks ore noted, and provided the system is not opened by disconnecting or removing components.

(19) When panel display reads CPL (complete), close the ***manifold hand set low*** side and ***high*** side valves. Perform charging procedure immediately. (Refer to paragraph 6)

4 Leak Detection

— WARNING —
Do not use an open flame leak detector.

a. Using the Robinair 34700 charging/test station

If step 3, a, (15) above indicates a leak, and location of the leak is not obvious, use the following procedure to locate leak.
(1) If recharge/test stand is not already connected to system, follow steps 4, a, (1) through (4) above.
(2) Open the high side (2) valve and allow 1/2 pound of refrigerant to enter the system. Close high (2) side valve. (Refer to Figures 21-10 and 21-11.)
(3) Locate leak(s) using an electronic leak detector designed to detect R12 and/or R134a refrigerant, as appropriate. Or, use soap and water in a thick solution.
(4) Repair leak(s).
(5) Discharge system per paragraph D, 5.
(6) Perform evacuation procedure per paragraph D, 3, a.
(7) Immediately perform charging procedure per paragraph D, 6.

b. Using A Manifold Hand Set.

If step D, 3, b, (16) above indicates a leak, and location of the leak is not obvious, use the following procedure to locate leak.
(1) Close both the low side and high side valves on manifold hand set.
(2) Disconnect manifold hand set middle port (yellow) hose from low side port on charging stand and connect it to a container of R12 or HFC134a refrigerant, as appropriate.
(3) Open refrigerant container service valve.
(4) Open the manifold hand set ***high*** side valve until a pressure of 50 psig is reached on ***low*** side gauge. Close ***high*** side valve.

(5) Locate leak(s) using an electronic leak detector designed to detect R12 and/or R134a refrigerant, as appropriate. Or, use soap and water in a thick solution.
(6) Repair leak(s)
(7) Check that the both ***high*** side and ***low*** side valves on the manifold hand set are closed.
(8) Close service valve on refrigerant container. Disconnect yellow manifold hand set center hose from refrigerant container.
(9) On systems equipped with quick disconnect connections, close coupler valves. Disconnect manifold hand set red and blue hoses from airplane service ports. Remove manifold hand set.
(10) Recover remaining refrigerant from system using the Robinair 34700 (or other approved) charging station. (Refer to paragraph D, 5.) Any quantity of oil recovered from aircraft must be measured and a equal amount of ***new*** oil (mineral oil or P. A. G., as appropriate) must be added to system before recharging.
(11) On systems equipped with quick disconnect connections, close coupler valves. Disconnect charging/test station from service ports.
(12) Perform evacuation procedure per paragraph D, 3, b.
(13) Immediately charge system per paragraph D, 6.

5. Discharging (Bleeding or Purging) System (Refer to Figure 10.)

This procedure is required when it is necessary to remove all refrigerant from air conditioning system.

The following instructions pertain to the Robinair 34700 charging/recovery station. Refer to manufacturers instructions when using a different make station.

— CAUTION —

Because United States environmental regulations prohibit the release of refrigerant into the atmosphere, an appropriately certified charging/recovery station MUST BE USED to discharge any air conditioning system.

— NOTE —

See Operator's Manual for detailed instructions for discharging system.

a. Gain access to service valves by removing rear access panel.
b. Remove protective caps from access valves.
c. Connect ***high side*** (red) hose to air conditioner ***high*** side service valve. On systems equipped with quick disconnect connections, open coupler valve.
d. Connect ***low side*** (blue) hose to air conditioner ***low*** side service valve. On systems equipped with quick disconnect connections, open coupler valve.
e. Check the ***low*** side gauge (GAUGE 1) and ***high*** side gauge (GAUGE 2) to determine that there is pressure in the system. If there is no pressure, there is no refrigerant in the system to recover.
f. Check that the oil drain valve is closed.
g. Open both the ***low*** side and ***high*** side valves on control panel.
h. Open the red GAS (vapor) and the blue LIQUID valves on the charging station's refrigerant tank.
i. ***SLOWLY*** open the oil drain valve to see if system oil separator contans oil. If it does, let oil drain into the oil drain battle (located at the bottom of the rear side of the charging station) until separator is empty.

j. Close the oil drain valve. Dispose of collected oil in an environmentally accepted manner. Return collection bottle to its place on the charging stand.
k. Plug unit into a proper voltage outlet. Turn MAIN POWER switch ON.
l. Press the RECOVER key on charging station keypad.
m. To assure complete recovery of refrigerant:
   (1) Wait 5 minutes. Observe pressure gauges for a rise above zero (0),
   (2) If a rise occurs, press the HOLD/CONT keys.
   (3) Repeat as necessary until system maintains pressure for two minutes.

— NOTE —

Drain oil separator after each job. Display will indicate OIL (OUNCES) or (GRAMS) as a reminder

n. ***SLOWLY*** open oil drain valve. Drain oil into the oil catch bottle. When all recovered oil has been completely drained, close oil drain valve.
o. Measure the amount of oil in the catch bottle. The same amount of ***new*** oil ***must*** be added to the system ***before*** charging the system.
p. To enter diagnostic mode simultaneously press the SHIFT/RESET and ENTER keys To display the amount of refrigerant recovered by the unit, press th 3 key. The panel display will read the amount of recovered refrigerant in pounds or kilograms.
q. Simultaneously press the SHIFT/RESET and ENTER keys to clear internal counter. Press SHIFT/RESET to return to the main menu.

6. Charging The System

— CAUTION —

Because United States environmental regulations prohibit the release of refrigerant into the atmosphere, an appropriately certified charging station MUST BE USED to charge any air conditioning system.

a. Using Robinair 34700 charging stand. (Refer to Figure 10)

When system is able to maintain 24 to 26 in Hg. pressure on the ***low*** side gauge (GAUGE 1) per paragraph D, 3, a, (13) through (15), or D, 3.b.(14) through (16), above, charge system as follows:

(1) Check that main power switch is OFF.

— CAUTION —

Do not place any weight, including hands and/or feet, on refrigerant tank or scale during charging process. Any weight disturbance will cause an incorrect transfer of refrigerant.

(2) Check that the LBS/KG. selector switch on back of unit is in desired measurement mode.

— NOTE —

You may enter the amount of refrigerant to be charged when the unit is turned ON. The unit will store the amount in memory until it is turned OFF.

(3) Open the ***low*** side (blue) valve on units control panel.
(4) If message PROGRAM and CHANGE do not display, press the CHG key to enter the PROGRAM mode.

— NOTE —

The amount of refrigerant required must be determined for each airplane. It is the amount that will result in bubble-free operation at the system sight gauge specified in paragraph 7. Post Charging Operational Check.

(5) Enter amount of refrigerant required to charge the system by pressing the appropriate number keys and ENTER on keypad.
(6) To begin charging process, press CHG key on keypad.
  (a) The digital display will read AUTOMATIC and show the amount of refrigerant programmed for the charge.
  (b) As the solenoid opens, it will make and audible sound.
  (c) The display will countdown to zero, and display message CPL, when charging is complete.
(7) Close ***low*** side (blue) valve. Check that the ***high*** (red) valve is also closed. Also close coupler valves on the Archer III.
(8) Perform post charging operational check per paragraph D, 7.

7. Post Charging Operational Check

— WARNING —

Verify area around the airplanes is clear and that a qualified person is at the airplane controls.

— NOTE —

Airplane must be headed into the wind during the following check.

a. Using Robinair 34700 charging stand.
(1) Check the the charging stand's ***blue*** hose is connected to the airplane's ***low*** side service port.
(2) Check that the charging stand's r***ed*** hose is connected the airplane's ***high*** side service port.
(3) Ensure that the charging stand's ***low*** and ***high*** side valves and both are ***closed***.
(4) If system uses HFC134a refrigerant, check that the ***coupler valves*** on both hoses are ***open***.
(5) Start engine.
  (a) Operate at 1000 rpm for two minutes. Check sight gauge for bubbles.
  (b) Operate at 2000 rpm for two minutes. Check sight gauge for bubbles.
(6) Any bubbles passing through sight gauge indicates that additional refrigerant is required.

— CAUTION —

United States environmental regulations prohibit adding refrigerant to any air conditioning system with leaks. Normally, a tight system will not loose refrigerant.

(7) Add refrigerant ***slowly*** through the ***low*** side valve until sight gauge remains bubble free.

(8) Operate engine at 1000 rpm to 1500 rpm. The ***low*** and ***high*** side gauges on the control panel shall indicate as follows:

GAUGE	AMBIENT TEMPERATURE	GAUGE INDICATION
Low Side (Pressure)	All	10 to 35 psig
High Side (Pressure)	Up thru 75° F	125 psig minimum to 175 maximum psig
High Side (Pressure)	Over 75° F	150 psig minimum to 300 maximum psig

(9) When charge is properly established:
  (a) Stop engine.
  (b) If system uses HFC134a refrigerant, close ***coupler valves***
  (c) Close ***low*** side valve on control panel.
(10) Disconnect charging stand hoses from service valves.
(11) Install protective caps on service valve.
(12) Install rear close out panel.

b. Using A Hand Manifold Set.

(1) Check the the ***blue*** hose on manifold set is connected to the airplane's ***low*** side service port.
(2) Check that the r***ed*** hose on manifold set is connected the airplane's ***high*** side service port.
(3) Check that the ***yellow*** hose on manifold set is connected to a tank of appropriate refrigerant (R12 or HFC134a).
(4) Ensure that both the ***low*** and ***high*** side (pressure) valves are ***closed***.
(5) If system uses HFC134a refrigerant, check that the ***coupler valves*** on both hoses are ***open***.
(6) Start engine.
  (a) Operate at 1000 rpm for two minutes. Check sight gauge for bubbles.
  (b) Operate at 2000 rpm for two minutes. Check sight gauge for bubbles.
(7) Any bubbles passing through sight gauge indicates that additional refrigerant is required.

— CAUTION —

United States environmental regulations prohibit adding refrigerant to any air conditioning system with leaks. Normally, a tight system will not loose refrigerant.

(8) Open refrigerant tank valve.
(9) Add refrigerant slowly through the low side valve until sight gauge remains bubble free.

THIS SPACE INTENTIONALLY LEFT BLANK

(10) Operate engine at 1000 rpm to 1500 rpm. The ***low*** and ***high*** side gauges on the manifold set shall indicate as follows:

GAUGE	AMBIENT TEMPERATURE	GAUGE INDICATION
Low Side (Pressure)	All	10 to 35 psig
High Side (Pressure)	Up thru 75° F	125 psig minimum to 175 maximum psig
High Side (Pressure)	Over 75° F	150 psig minimum to 300 maximum psig

(11) When charge is properly established:
- (a) Stop engine.
- (b) Close valve on refrigerant tank.
- (c) If system uses HFC134a refrigerant, close ***coupler valves***
- (d) Close ***low*** side valve on manifold set.

(12) Disconnect manifold set hoses from service valves.
(13) Install protective caps on service valve.
(14) Install rear close out panel.

E. COMPONENT SERVICE

1. Compressor Service

— CAUTION —

Prevent dirt or foreign material from entering system. Cap all hose and tubing ends immediately. Use same type refrigerant oil (mineral oil or PAG) as in compressor to lubricate components for assembly.

Do not service compressor in the field. Service must be done by a qualified shop having special equipment and trained personnel to properly service unit.

Maintenance to unit and related components is limited to worn drive belt and magnetic clutch replacement. Other service requires compressor removal from system.

a. Compressor Removal

— CAUTION —

Cap all open lines immediately to prevent dirt and moisture from entering system.

NOTE

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when discharging or charging system.

(1) Circuit protector for air conditioning system must be off.
(2) Remove engine cowl and right front baffles.
(3) Disconnect electrical leads to magnetic clutch on compressor.
(4) Using an approved refrigerant recovery system, completely discharge and depressurize air conditioning system. Refer to paragraph D, 5.
(5) Remove suction and discharge lines
  (a) On Archer II, remove suction and discharge lines from compressor service valves.
  (b) On Archer III, remove suction and discharge lines from compressor Tub-O fittings.
(6) Loosen bolt securing compressor idler pulley to release belt tension and remove belt from compressor pulley. (Do not force belt over pulleys.)
(7) Support compressor and remove 6 bolts securing compressor to engine mounting brackets and remove compressor from engine compartment.

b. Compressor Installation

— WARNING —

If air conditioner is operated on ground for servicing, clear test area of loose objects. Ensure that a qualified person is at the airplane controls. Use service valves on evaporator assembly for testing.

(1) Place compressor to mounting brackets. Install six bolts and progressively tighten to a torque of 14 to 17 foot pounds. (Safety all bolts with 0.032 safety wire.)
(2) Check oil level in compressor per instructions in paragraph E, 1, c, Checking Compressor Oil.

— CAUTION —

Do not force belt into pulley sheave. If necessary, remove idler assembly.

(3) Place drive belt over clutch pulley and adjust alignment of pulleys and belt per instructions in replacement of compressor and alternator drive belts.
(4) Connect discharge and suction lines to:
  (a) service valve fittings on compressor on Archer II.
  (b) Tub-O fittings on Archer III.

NOTE

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when evacuating, discharging or charging system.

(5) Evacuate system per paragraph C, 3, a or b.
(6) Charge system per paragraph C, 6, a.
(7) Install right front baffle.
(8) Install engine cowl.

c. Checking Compressor Oil

— WARNING —

Do not remove oil plug with pressure in system.

— CAUTION —

The 10 ounce oil level is required in compressors installed on new systems. Some oil is distributed in the system during operation. Charge replacement compressors with 10 ounces of oil.

Check oil level each time system is discharged. Check compressor oil as follows:

NOTE

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when evacuating, discharging or charging system.

(1) Discharge system. (Refer to discharging.)
(2) Make an oil dipstick. (Refer to figure 21-12.)
(3) Remove 0.375 inch oil fill plug in top side of compressor crankcase.
(4) Before inserting dipstick, crankshaft Woodruff key must be in up position. (Front face of compressor clutch is marked with a stamped K indicating key position.) Measure oil level from lowest point in crankcase. Use long end of dipstick. (See figure 21-12.)
(5) When compressor is installed, use chart 2106 for proper amount of oil in crankcase.
(6) Do not operate compressor with less than 6 ounces oil. Do not add more than 10 ounces oil. On systems using R-12 refrgerant, use Piper refrigerant oil PMS-L2000 or equivalent 500 viscosity refrigerant oil. On systems utilizing HFC-1342, use PAG-21941.
(7) Evacuate and charge system. (Per evacuating the system and charging the system.)

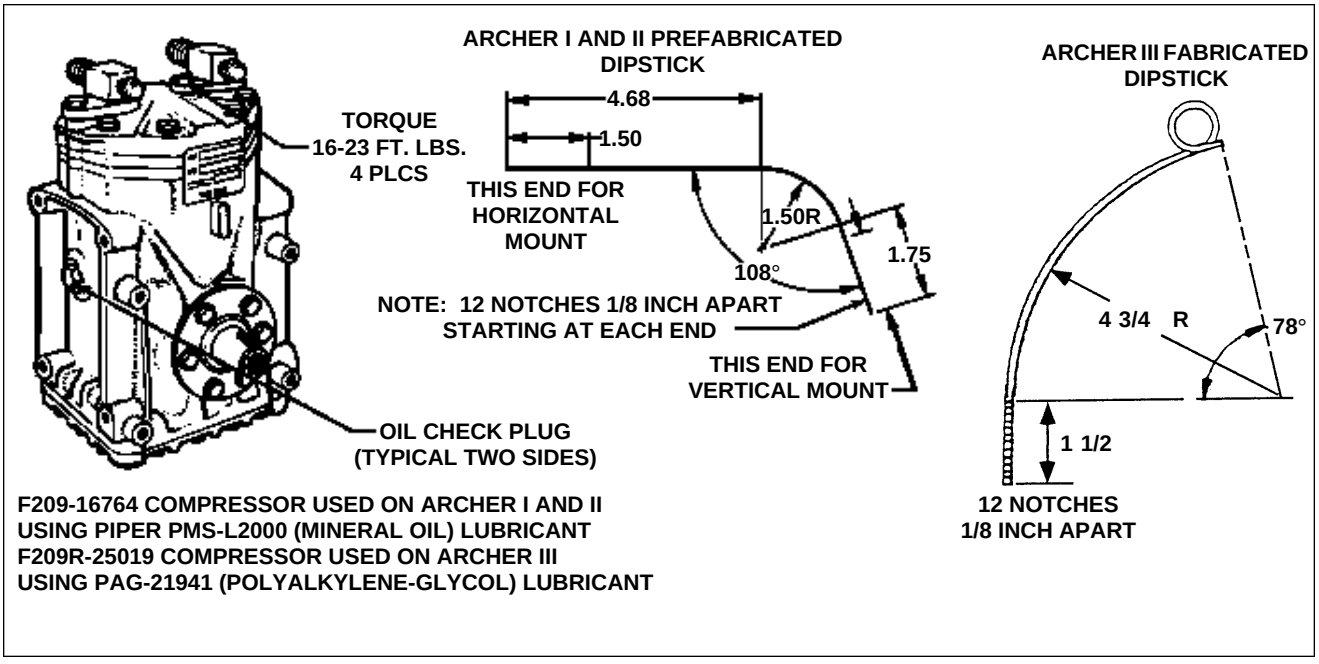


Figure 21-12. Compressor and Fabricated Oil Dipstick

CHART 2107. COMPRESSOR OIL CHARGE

Oil Charge Ounces	6	8	10	16
Dipstick Reading Inches	13/16''	1.00''	1-3/16''	1-15/16''

d. Replacement Of Compressor Drive Belt (Refer to figure 21-13.)

(1) Remove old belt by removing spinner, propeller, nose cowl, engine baffles as required, starter ring gear assembly, and drive belt.

— CAUTION —

Do not force belt into pulley sheave. Remove idler assemblies, if necessary, and alternator lower mounting bolts to install belt.

(2) Position new belt on starter ring gear sheaves.
(3) Install starter ring gear assembly, propeller, and spinner.
(4) Route belt to proper pulley sheave per figure 21-13.
(5) Check compressor and alternator belt and pulley alignment as follows:

— CAUTION —

Verify there is ring gear surface contact to provide a solid base for straightedge.

(a) Establish a datum line for checking belt and pulley alignment. Establish a nominal dimension between forward edge of compressor belt and forward machined surface of ring gear. This dimension must be taken at ring gear assembly where the belt is in its sheave. Check for misalignment at the other pulley sheaves by using a stiff straightedge long enough to extend from front of ring gear to component sheaves.
(b) Obtain a basic measurement from top of ring gear by measuring the width of starter ring gear plus the dimension from the forward machined surface of ring gear to forward edge of compressor drive belt. (Refer to figure 21-13.)
(c) Checks and adjustments of compressor and alternator drive belts require different procedures. Refer to the following instructions.

(6) Compressor Belt Alignment: (Refer to figure 21-13.)
(a) Place straightedge against right forward side of ring gear and measure belt alignment at compressor sheave (Point-B).
(b) Measure belt alignment at compressor idler pulley (Point-A). Belt misalignment at Point-A must be half the misalignment of Point-B and the dimension at top of ring gear and same direction fore and aft. (Refer to Table 21-09.)

CHART 2108. COMPRESSOR MISALIGNMENT AND IDLER PULLEY NOMINAL LOCATION

Compressor Pulley Misalighment From Ring Gear Pulley	0.010	0.020	0.030	0.040	0.050	0.060
Idler Pulley Nominal Location	0.006	0.011	0.017	0.022	0.028	0.033

(c) If Point-A nominal misalignment is not within 0.030 inch, per Step (b), add or remove shims as required. Belt alignment must be made as close to nominal as shims will allow.

(7) Alternator Belt Alignment: (Refer to figure 21-13.) Align idler pulley in the belt plane by adding or removing shims, with alternator belt installed.

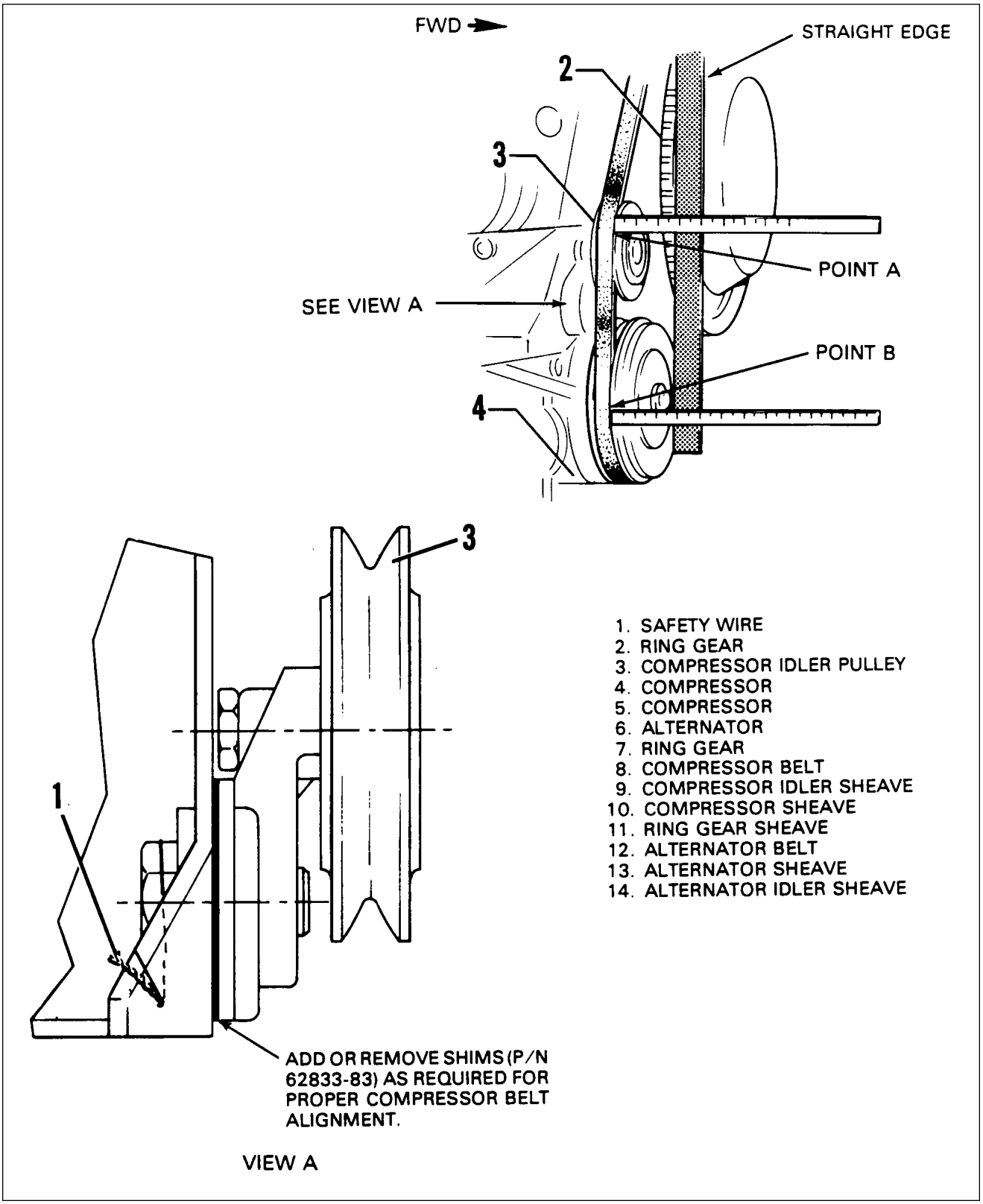


Figure 21-13. Compressor and Alternator Belt Installation (Sheet 1 of 2)

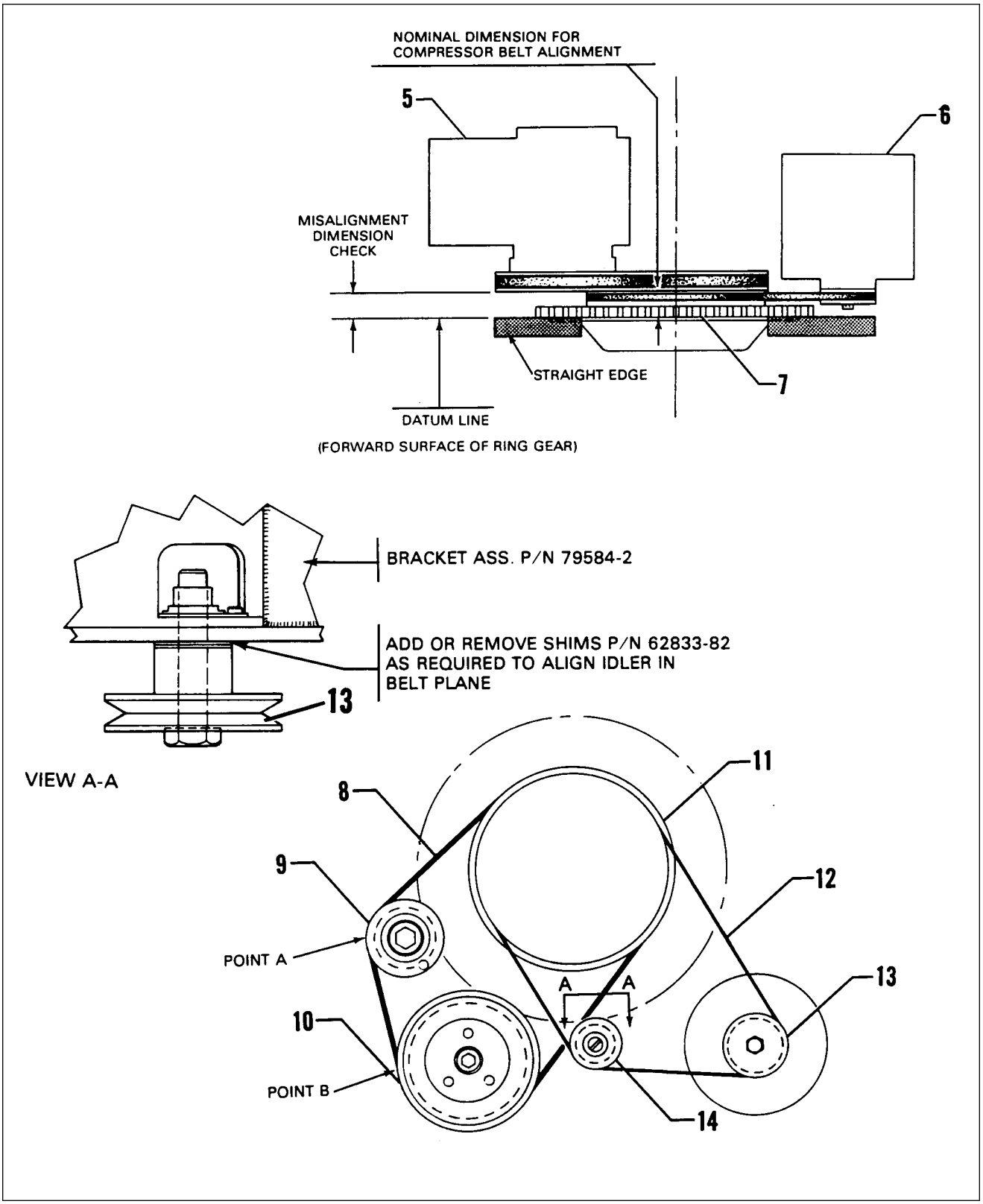


Figure 21-13. Compressor and Alternator Belt Installation (Sheet 2 of 2)

e. Adjustment Of Drive Belt Tension

— CAUTION —

The higher tension specified for a new belt is to compensate for initial stretch at first operation. Do not apply higher tension values to used belts.

Proper adjustment of compressor and alternator drive belts will ensure longer belt life and proper component operation. Adjust Dayco belts per step (1). Adjust Gates belts per step (2).

(1) Adjust ***Dayco*** belts as follows:.

(a) Use a calibrated belt tension gauge to adjust a new ***compressor*** belt to 120 pounds span tension.

(b) Use a calibrated belt tension gauge to adjust a new ***alternator*** belt to 90 to 100 pounds span tension.

(c) Install engine baffles if removed and install engine cowl.

— CAUTION —

If air conditioner is operated on the ground for servicing, clear test area of any loose objects lying on ramp. Ensure that a qualified person is at the airplane controls.

(d) Run engine 15 minutes at 1200 rpm.

(e) Shut down engine, remove engine cowl, and check both belt tensions. If compressor belt tension falls to 60 pounds, tension to 80 pounds. If alternator belt tension falls below 50 pounds, tension to 70 pounds.

(f) Check tension every 100 hours or annual inspection, whichever comes first.

(g) Check all idler and bracket bolts for safety. Install engine cowl.

(2)Adjust ***Gates*** belts as follows:

(a) Use a calibrated belt tension gauge to adjust a new ***compressor*** belt 73 to 87 pounds of static tension.

(b) Use a calibrated belt tension gauge to adjust a new ***alternator*** belt 65 to 70 pounds static tension. Adjust a used belt 35 to 40 pounds static tension.

(c) Install engine baffles if removed. Install engine cowl.

— CAUTION —

If air conditioner is operated on the ground for servicing, clear test area of any loose objects lying on ramp. Ensure that a qualified person is at the airplane controls.

(d) Run engine 15 minutes at 1200 rpm.

(e) Shut down engine, remove engine cowl, and check both belt tensions.

(f) Check tension every 100 hours or annual inspection, whichever comes first.

(g) Check all idler and bracket bolts for safety. Install engine cowl.

2. Magnetic Clutch

a. Magnetic Clutch Removal (Refer to figure 21-14.)

— CAUTION —

Do not use a wheel puller on outer flange of pulley. This will damage pulley grooves or clutch bearings.

(1) Remove self-locking capscrew and washer from compressor shaft.
(2) Insert 5/8 - 11 UNC-2B bolt in threaded part of hub and tighten. Pressure exerted by the bolt on compressor crankshaft end will force off rotor pulley assembly without clutch or compressor damage.
(3) Remove four bolts securing field assembly against compressor bosses and remove bolts, washers, and field assembly.

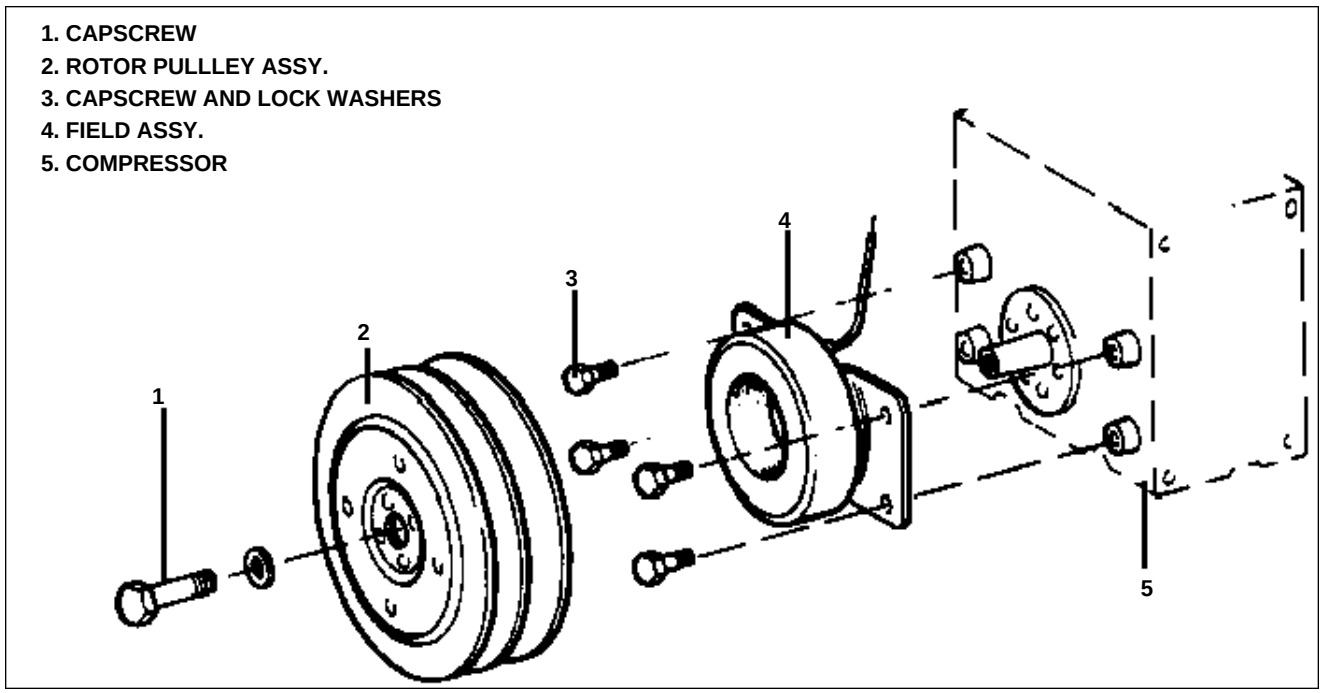


Figure 21-14. Magnetic Clutch

b. Magnetic Clutch Installation (Refer to figure 21-14.)

— CAUTION —

Compressor shaft must be clean and free from burrs.

(1) Position field assembly against the compressor bosses, with electrical leads to cylinder side of compressor.
(2) Secure field assembly with four capscrews and lockwashers, (do not torque at this time).
(3) Connect electrical lead from the field assembly. On Archer III models, the ground wire must also be connected.
(4) Slide pulley assembly over field assembly and onto crankshaft, now tighten field assembly to a torque of 85 to 120 inch-pounds. Secure pulley assembly with washer and new self-locking capscrew. Tighten capscrew to a torque of 180 to 240 inch-pounds.

— NOTE —

If clutch is not engaged while tightening capscrew, insert a spanner into holes in armature face.

(5) Spin pulley by hand to check interference between the field and rotor pulley assemblies. If there is interference, a rubbing noise can be heard as pulley rotates . Remove rotor pulley assembly and adjust field assembly mounting until the interference is eliminated.

3. Refrigerant Lines And Routing

— CAUTION —

Discharge system completely before hose couplings are uncoupled. (See paragraph D, 5, Discharging System.)

— NOTE —

United States environmental regulations prohibit the reslease of refirgerant into the atmosphere. Special equipment is required when discharging or recharging system.

Handle refrigerant lines carefully. Refrigerant lines are flexible high pressure hoses. Hoses in powerplant area are routed for maximum protection from heat and abrasion. They couple at firewall to hoses routed through the two inboard, external hat sections on bottom of fuselage, up through floor to condenser and evaporator in tail cone. Discharge is in the right hand hat section. The suction is in the left hand hat section.

4. Receiver-Dehydrator

a. Receiver-Dehydrator Removal

— CAUTION —

Receiver-dehydrator is not serviceable, it must be replaced. Receiver-dehydrator must be replaced when system has operated without a charge or has been left open.

The unit is mounted on inboard side of evaporator assembly housing.

(1) Discharge system of all refrigerant. (See discharging.)
(2) Uncouple refrigerant lines at receiver-dehydrator. (See special servicing procedures.
(3) Remove clamp attaching unit to evaporator housing.

b. Receiver-Dehydrator Installation

On systems utilizing HFC 134a refigerant, use only receiver-dehydrators marked with a ***GREEN*** arrow.

(1) Slip mounting bracket around receiver and put it in place on evaporator housing with tube fitting on top. Align fittings to proper line before securing mounting bracket.

— NOTE —

Tighten fittings to torque listed in charts 2105 and 2106.

(2) Evacuate and charge system per evacuating the system and charging the system.

5. Condenser

a. Condenser Removal

Condenser is mounted in a frame assembly in fuselage bottom between stations 156.00 and 191.00.

(1) Discharge system. (See special servicing procedures and discharging.)
(2) Remove access panel from aft bulkhead of cabin.
(3) Remove forward cover panel.
(4) Uncouple suction and discharge hoses at condenser fitting. (See special servicing procedures.) Remove hose clamps holding hoses to condenser frame.
(5) Remove AN-3 bolts from upper ends of side hinges and rod ends.
(6) Support condenser assembly and remove bolt attaching actuating rod to condenser assembly.
(7) Lower aft end of assembly on the piano hinge at assembly forward end.
(8) Remove eight screws attaching piano hinge to condenser frame assembly and remove.
(9) To remove condenser core from assembly, remove screws in the side mounting frame.

b. Condenser Installation

(1) Install condenser core to frame assembly with hose fittings forward and RT fitting pointed inboard.
(2) Place condenser and frame assembly to fuselage frame mounting bracket and insert the eight screws into piano hinge.
(3) Attach side hinges, actuating rod, and rig per condenser assembly rigging instructions.
(4) Seal and couple hose fittings (seal with Loctite refrigerant sealant applied to flares only).
(5) Adjust condenser per condenser assembly rigging instructions.

— WARNING —

Cabin rear panel must be replaced and sealed in the original manner. If not sealed properly, exhaust gases can seep into cabin due to low pressure area in cabin.

— WARNING —

Test for carbon monoxide on ground and in flight with and without air conditioner operating. Presence of CO must not exceed 1 part in 20,000.

(6) Seal around forward cover panel (and aft cover panel if removed) with Permagum Bead no. 576 purchased from Prestolite Engineering Company. (See Figure 21-15.)

c. Condenser Door Actuator

The actuator is on a bracket mounted between two bulkheads in tail cone. It is coupled to the condenser assembly through a bellcrank mounted to a bracket on bulkhead aft of condenser. Actuator travel is controlled by two limit switches. Both up and down switches are on the actuator. Refer to Figure 21-15 for switch locations.

d. Condenser Assembly Rigging Instructions. (Refer to Figure 21-15.)

Condenser assembly is actuated by an electric motor through bellcranks, push rods, and limit switches. Condenser door must fit flush with fuselage skin, and with increased force along forward edge. Use the following steps:

(1) Adjust open limit switch to open condenser door 5.00 0.50 inches measured from leading edge of door to fuselage skin.
(2) Adjust side push rods so a vertically measured gap of 0.16 inch exists along trailing edge of door the instant forward edge of door is flush with fuselage skin.
(3) Fully close door and adjust CLOSED limit switch so actuator travels an additional 0.12 inch with door fully closed, (this is necessary to preload mechanism). (Refer to figure 21-14, View A-A.)
(4) Cycle assembly several times. Verify proper operation without binding.

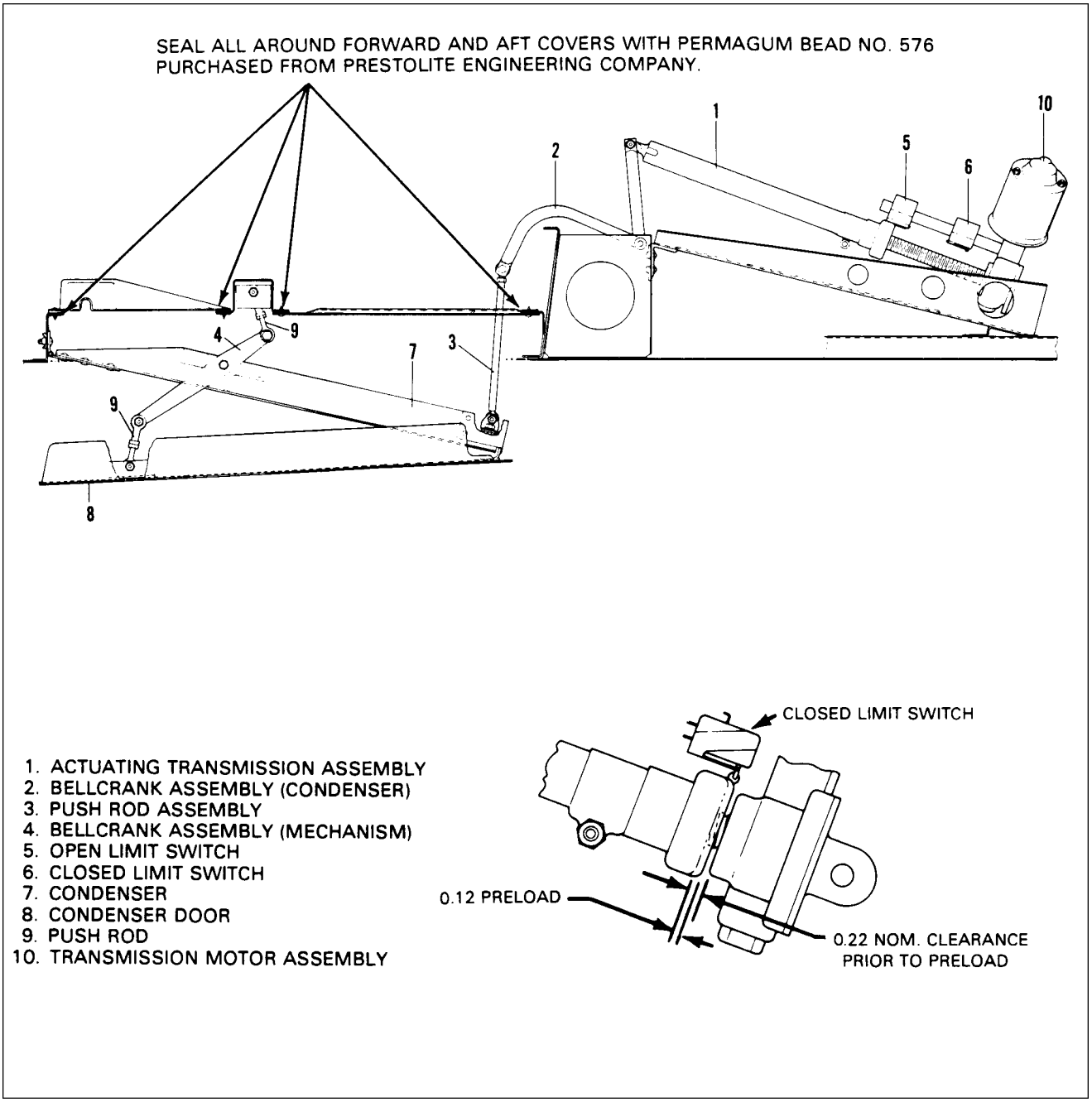

SEAL ALL AROUND FORWARD AND AFT COVERS WITH PERMAGUM BEAD NO. 576 PURCHASED FROM PRESTOLITE ENGINEERING COMPANY.
1. ACTUATING TRANSMISSION ASSEMBLY
2. BELLCRANK ASSEMBLY (CONDENSER)
3. PUSH ROD ASSEMBLY
4. BELLCRANK ASSEMBLY (MECHANISM)
5. OPEN LIMIT SWITCH
6. CLOSED LIMIT SWITCH
7. CONDENSER
8. CONDENSER DOOR
9. PUSH ROD
10. TRANSMISSION MOTOR ASSEMBLY
CLOSED LIMIT SWITCH
0.12 PRELOAD
0.22 NOM. CLEARANCE PRIOR TO PRELOAD

Figure 21-15. Condenser Air Scoop Installation

6. Expansion Valve

a. Expansion Valve Removal (Refer to figure 21-17.)

— NOTE —

If part is not serviceable, it must be replaced with a new part.

The expansion valve is in evaporator assembly between receiver dehydrator and evaporator inlet. The capillary coil is attached to evaporator outlet line.

(1) Remove access panels, and discharge system. Refer to paragraph D, 5.
(2) Remove capillary coil from outlet line. (Do not kink capillary tube.)
(3) Uncouple all related tube fittings. (See special servicing procedures.)

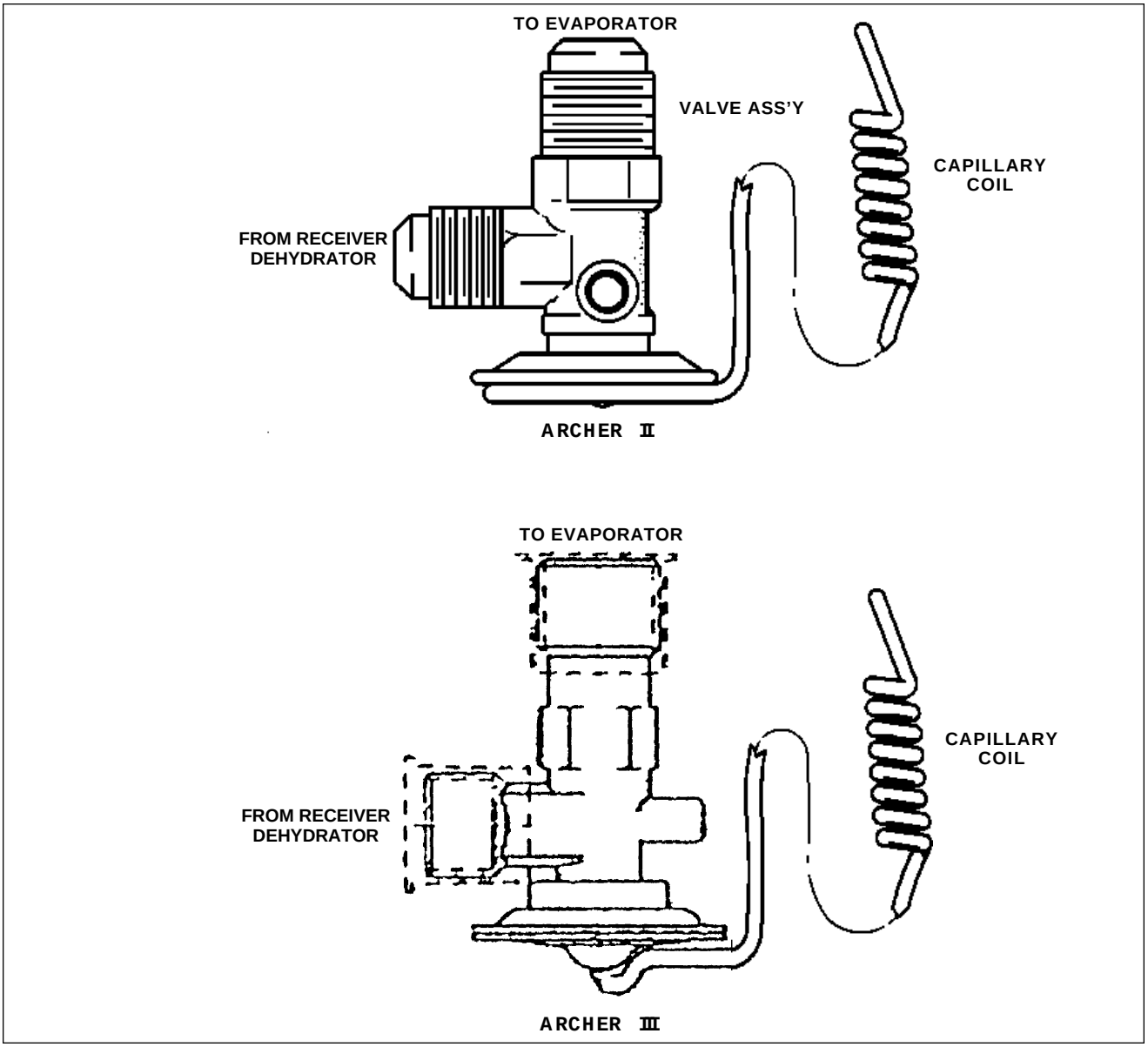


Figure 21-16. Expansion Valve

b. Expansion Valve Installation

(1) On systems using R-12 refrigerant, install expansion valve in inlet line of evaporator core by coupling related fittings. Seal all couplings with sealant applied to tube flanges only. Tighten fittings to a torque listed in Charts 2105 and 2106. On systems utilizing HFC-134a, replace O-ring on fittings and tighten per torques listed in Chart 2105.
(2) Secure capillary coil to evaporator outlet line.
(3) Evacuate and charge system. (See evacuating the system and charging the system. Refer to paragraphs D, 3 and D, 6.)
(4) Check for leaks. (See checking the system for leaks. Refer to paragraph D, 4.)
(5) Replace access panels.

7. Evaporator

a. Evaporator Removal

— CAUTION —

Discharge the system before disassembling any components for service.

— NOTE —

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when discharging or recharging system.

Evaporator assembly consists of evaporator core, receiver-dehydrator, expansion valve, circulating fan, pressure switch, necessary housing, and plumbing. The housing is made of thermoplastic material. The condensed moisture is dumped overboard through a hose clamped to fitting on bottom of evaporator housing.

Evaporator assembly is behind cabin rear panel, attached to mounting panel with 12 screws, washers, and a bracket securing the back to mounting panel.

(1) Remove air conditioning filter cover, filter, and rear access panels.
(2) Uncouple the liquid line from inlet side of receiver-dehydrator and suction line from evaporator core outlet. (See special servicing procedures.)
(3) Disconnect related electrical wires.
(4) Remove flexible air duct from housing outlet. Remove drain hose from housing.
(5) Remove temperature probe from evaporator housing.
(6) Remove screws attaching support bracket and evaporator housing to mounting panel.
(7) Remove assembly through access hole in bulkhead.

b. Evaporator Installation

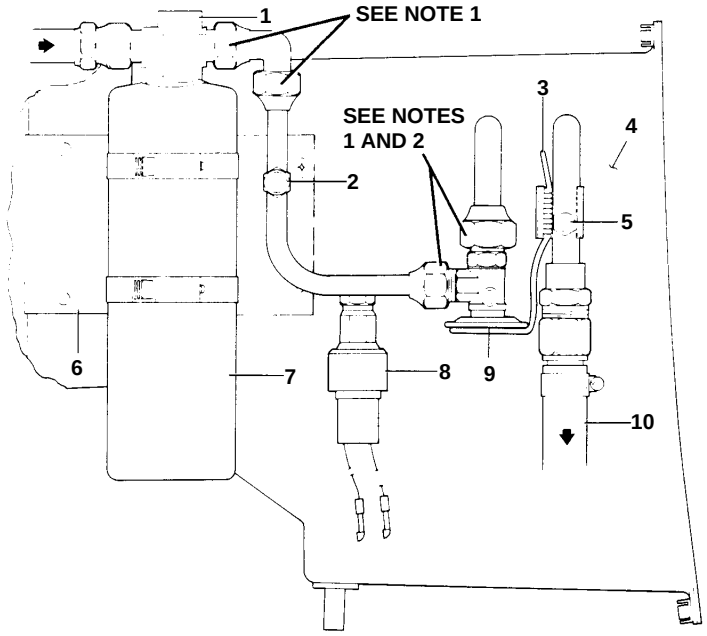
(1) Cement gasket in place on flanges of evaporator housing and attach large end of mounting gasket to back of housing.
(2) Install housing through access hole with air duct outlet on top. Mate mounting flanges to surface of mounting panel and insert screws. (Do not tighten at this time.)
(3) Line mounting bracket with mating holes in mounting panel, insert screws and tighten. Tighten screws in flange. Check gasket is in place. Flange seal must be air tight.

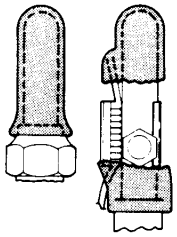
(4) Couple suction and discharge lines to their proper fittings (apply Loctite refrigerant sealant to tube flares only).
(5) Evacuate and charge system. (See evacuating the system and charging the system.)
(6) Check for leaks (see checking the system for leaks). If no leaks are detected, seal, and install access panel on evaporator housing.
(7) Couple flexible air duct and drain tube.
(8) Make and check electrical connections. (Refer to figure 21-18.)
(9) Check blower operation and refrigerant systems.

— WARNING —

Rear cabin panel must be replaced and sealed in original man - ner to prevent exhaust from entering cabin. After removing and replacing rear panel, conduct a carbon monoxide (CO) test on the ground and in flight with and without air conditioner operating. Presence of CO must not exceed one part in 20,000.

(10) Install and seal rear bulkhead panels.





WRAP TAPE AROUND THERMO-STAT CAPILLARY LEAVING SER-VICE PORT ACCESSIBLE.

1. SIGHT GLASS
2. SERVICE VALVE - SCHRADER - HI (SEE NOTE 2)
3. CAPILLARY COIL
4. HOUSING ASSEMBLY
5. SERVICE VALVE - SCHRADER - LOW (SEE NOTE 2)
6. RECEIVER DEHYDRATOR CLAMP
7. RECEIVER DEHYDRATOR
8. PRESSURE RELIEF SWITCH (SYSTEMS UTILIZING R-12 USES RANCO SWITCH) (SYSTEMS UTILIZING HFC 134a USES TEXAS INSTRUMENT SWITCH)
9. EXPANSION VALVE
10. OUTLET HOUSE

NOTES

1. TORQUE FITTINGS TO 270-300 IN. LB. ON SYSTEMS USING R-12. TORQUE FITTINGS PER CHART 2105 ON SYSTEMS USING HFC 134a.
2. ARCHER I & II = THREADED FITTINGS. ARCHER III = QUICK DISCONNECT FITTINGS

Figure 21-17. Components Installation

8. Pressure Relief Switch

a. Ranco - Used with system utilizing R-12 refrigerant.

— CAUTION —

Before relief switch removal, air conditioning system must be discharged. (Refer to paragraph D, 5, Discharging.)

— NOTE —

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when discharging or recharging system.

b. Texas Instrument - Used with system utilizing HFC 134a refrigerant.

— CAUTION —

Before relief switch removal, air conditioning system must be discharged. (Refer to paragraph D, 5, Discharging.)

— NOTE —

United States environmental regulations prohibit the release of refrigerant into the atmosphere. Special equipment is required when discharging or recharging system.

(1) Remove electrical connections from switch.
(2) Remove switch assembly from service port on steel line.
(3) Apply sealant sparingly to flare.
(4) Install new switch.
(5) Charge system.

9. Electrical Installation

The wiring harness is connected to switches in the climate control center on the right side of the instrument panel. The harnesses cross the instrument panel to the left side where two wires are taken off for the compressor clutch. The harness then passes aft along the left side of fuselage connecting to the blower motor, the pressure relief switch, and the condenser actuating motor. Two fuses behind the air conditioning system control panel and a 20 amp circuit breaker mounted in circuit breaker panel protects the complete air conditioning electrical system.

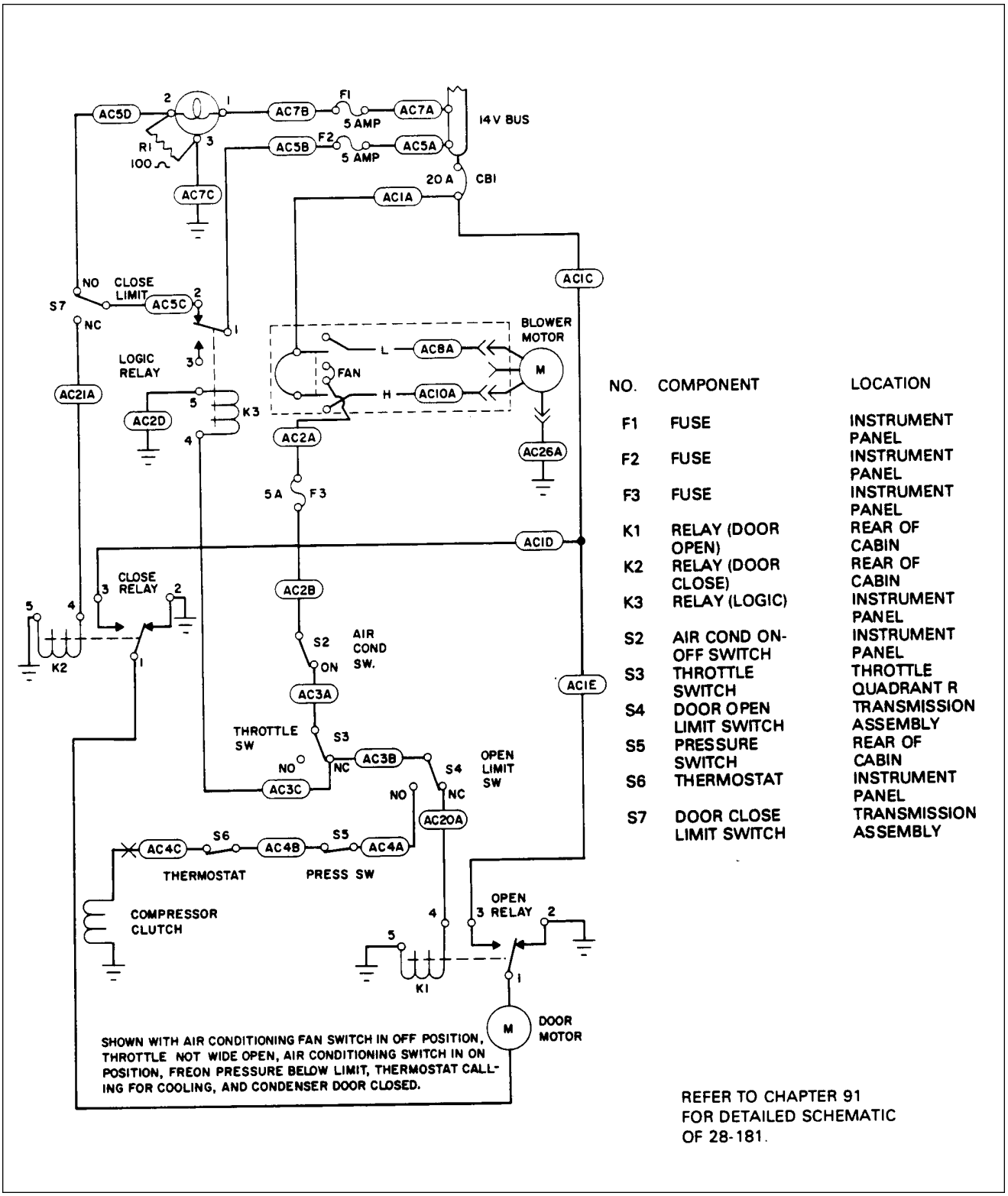
a. Adjustment of Throttle Switch

The throttle switch is mounted forward and below the throttle arm. The switch must be adjusted to actuate at the last quarter inch of full open throttle travel. Position the switch so that the throttle arm contacts the center of the switch actuator button.

b. Fuse Replacement

Locate the fuse to be replaced behind the air conditioning system control panel.

(1) Open the fuse holder by applying a slight pushing and counterclockwise twisting pressure.
(2) Remove blown fuse and insert a new 5 amp fuse
(3) Close the fuse holder by applying a slight pushing and clockwise twisting pressure.



NO.	COMPONENT	LOCATION
F1	FUSE	INSTRUMENT PANEL
F2	FUSE	INSTRUMENT PANEL
F3	FUSE	INSTRUMENT PANEL
K1	RELAY (DOOR OPEN)	REAR OF CABIN
K2	RELAY (DOOR CLOSE)	REAR OF CABIN
K3	RELAY (LOGIC)	INSTRUMENT PANEL
S2	AIR COND ON-OFF SWITCH	INSTRUMENT PANEL
S3	THROTTLE SWITCH	THROTTLE QUADRANT R
S4	DOOR OPEN LIMIT SWITCH	TRANSMISSION ASSEMBLY
S5	PRESSURE SWITCH	REAR OF CABIN
S6	THERMOSTAT	INSTRUMENT PANEL
S7	DOOR CLOSE LIMIT SWITCH	TRANSMISSION ASSEMBLY

Figure 21-18. Air Conditioning Wiring Schematic (typical) - Archer II
Sheet 1 of 2

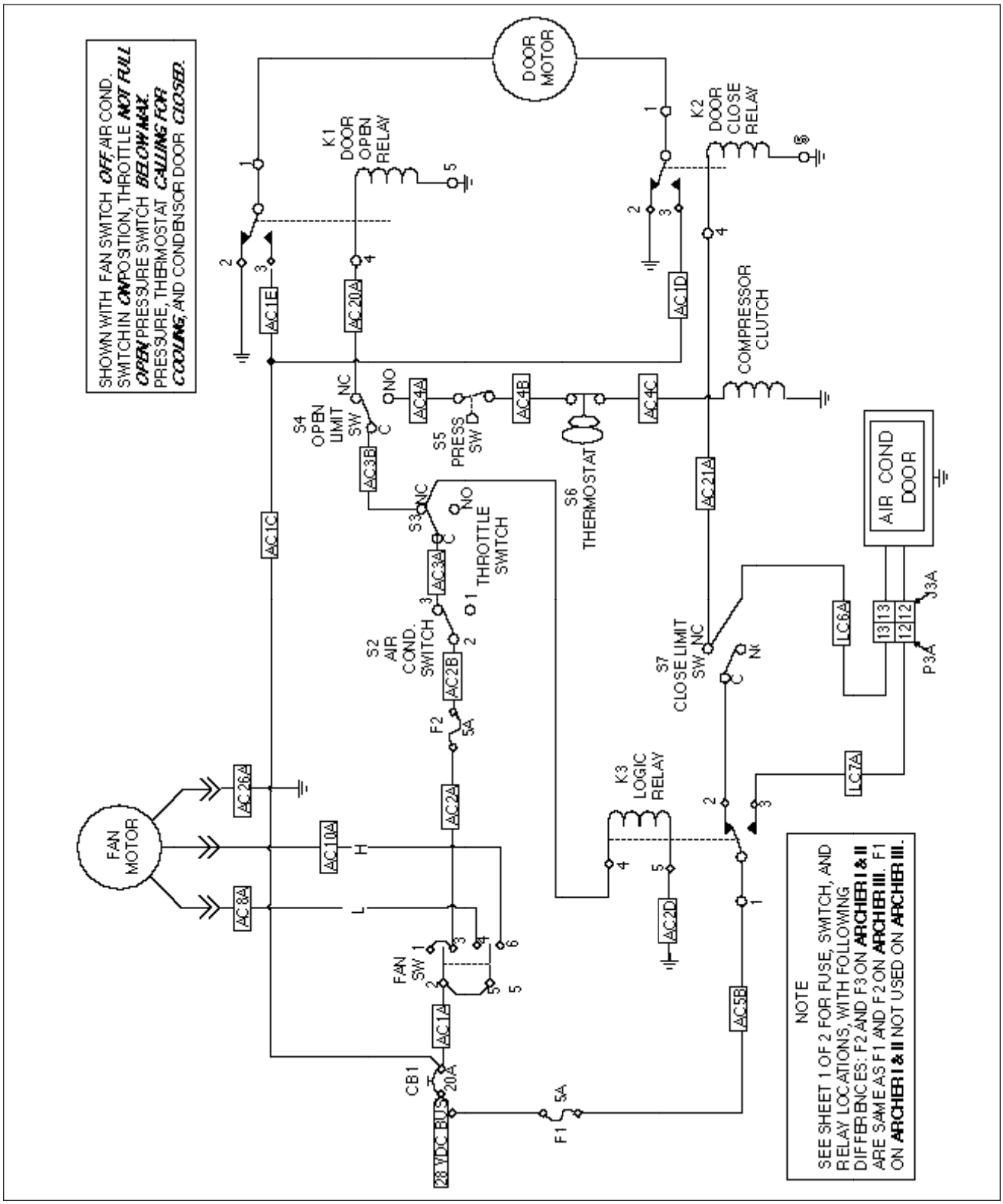


Figure 21-18. Air Conditioning Wiring Schematic (typical)
Archer III Sheet 2 of 2

Island Enterprises

GRIDS 1H21 THROUGH 1H24
INTENTIONALLY LEFT BLANK

CABIN VENT SYSTEM

A. OVERHEAD VENT SYSTEM. (NOT AVAILABLE WITH AIR CONDITIONING)

The overhead vent system uses the same ducting as air conditioning system. (Refer to Figure 21-2.) Air enters an inlet at top of the vertical fin and is ducted through the vent system. Small louvers control air flow into cabin. The vent system may be equipped with a blower (optional). When installed, the blower is mounted behind the aft close-out panel underneath the top of the fuselage.

B. OVERHEAD VENT BLOWER.

1. Overhead Vent Blower Description

The blower is mounted in the aft section of the fuselage and is connected to the overhead vent system. Depending on the system installed, the blower draws air in from the dorsal fin (s/n's 28-7690001 through 28-7990589), or from the left side of the fuselage (s/n' 28-8090001 and up), and forces it through the ducting. The blower switch is mounted on the instrument panel and, on s/n's 28-7690001 through 28-7890061, has four positions providing three blower speeds, while s/n's 28-7890062 and up have a three position switch providing two blower speeds.

2. Removal Of Blower Assembly

a. Remove access door from aft wall of baggage area.
b. With master switch off, disconnect plug assemblies at blower assembly.
c. Remove inlet and outlet hoses from blower assembly by removing clamps.
d. Remove screws, washers, and nuts that secure blower assembly to hanger braces.
e. Remove screws and washers which secure blower assembly to retainer and hangers.
f. Remove blower assembly from aircraft.

3. Disassembly Of Blower Assembly

a. Remove hose duct from forward edge of blower assembly by removing nuts, washers, and screws.
b. Remove cover from blower assembly by removing nuts, washers, and screws.
c. Remove blower an from motor shaft by removing set screw.
d. Remove motor, as follows:
   (1) Separate plate from motor cover by carefully drilling out connecting rivets.
   (2) Cut motor wires at edge of receptacle and plug. Remove wire ends from blocks.
   (3) Remove motor from mounting plate by removing nuts, washers, and bolts.

4. Reassembly Of Blower Assembly

a. Mount motor on plate and secure with bolts, washers, and nuts. Check motor nuts are snug and shaft spins freely.
b. Position cover over motor plate with motor wires protruding through cover grommet.
c. Match holes in cover to holes in motor plate and secure the two parts together with rivets.
d. Apply PRC-5000 sealant to fill any opening left after wires are brought through grommet.
e. Install wires in plug and receptacle.

f. Position blower in on motor shaft and secure with set screw.
g. Secure cover to blower assembly with screws, washers, and nuts.
h. Position hose duct on blower assembly, secure with screws, washers, and nuts. Screws must be installed with their heads inside duct.
i. After cleaning surfaces of all old sealant, use white rubber chalk PRC-5000 sealant to seal where duct attaches to blower assembly.

5. Installation Of Blower Assembly

a. Position blower assembly in hangers and retainer. Install washers and screws.
b. Install nuts, washers, and screws securing blower assembly to hanger braces.
c. Seal all hose joints with Arno no. C-520 wrap tape. Install inlet and outlet hoses and secure with clamps.
d. With master switch off, connect plug and receptacles at blower.
e. Check blower or proper operation.
f. Install access door to aft wall of baggage area and secure with the attaching hardware.

CHART 2109. BLOWER SYSTEM COLOR CODES

	MOTOR WIRES					AIRCRAFT WIRES		
		Pin Nos.[1]	15920-01 General Industries	E362Q Singer Controls	F0018075FA Leece Nevile	Aircraft Harness	Pin Nos.[1]	
Ground	Plug	2	Brown	Brown	Black	AC26A	2	Receptable
Low Speed		1	Red	Yellow	Yellow	Black	1	
Medium Speed[2]	Receptable	2	Black	Red	Red	White	2	Plug
High Speed		1	Yellow	Orange	Orange	Red	1	
YY1S062 ESB - Universal Elect. Company								
Ground	Plug	2	Brown			AC26A	2	Receptable
Low Speed		1	Yellow			Black	1	
Medium Speed[2]	Receptable	2	Red			White	2	Plug
High Speed		1	Orange			Red	1	

NOTES
1 Pin number 1 as sat the pointed side of the plug and receptacle
2 Not used on PA 28-8090001 and up.

— END —

GRIDS 1I4 THROUGH 1I5
INTENTIONALLY LEFT BLANK

CHAPTER

22

AUTO FLIGHT

1I6

CHAPTER 22 - AUTOFLIGHT

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
22-00-00	GENERAL	1I8	
22-10-00	AUTOPILOT	1I9	
22-10-00	Non-Piper AFCS Equipment Manufacturers	1I9	
22-10-00	Piper AFCS Equipment	1I9	

GENERAL

—WARNING—

It is the user's responsibility, when servicing or inspecting vendor equipment installed in Piper aircraft, to refer to the applicable vendor publication.

—WARNING—

Do not use a substitute trim system component part for an origi - nal design part. The fail-safe characteristics of the system will be compromised. A trim system running the wrong direction is the same as a run-away. Such conditions will cause excessive pilot yoke force in only 3 to 4 seconds.

Due to the wide variety of Automated Flight Control System (AFCS) options, it is mandatory to follow service literature published by the individual manufacturer of the AFCS equipment installed in any airplane. This includes mechanical service such as; adjusting bridle cable tension, servo removal and installation, servo clutch adjustments, etc.

THIS SPACE INTENTIONALLY LEFT BLANK

AUTOPILOT

A. NON-PIPER AFCS EQUIPMENT MANUFACTURERS

Refer to following list of AutoPilot/ Flight Director manufacturers for service direction, parts support, and service literature:

Bendix Avionics Division
2100 NW 62nd Street
Fort Lauderdale, FL 33310
(305) 776-4100/TWX 5109559884

Collins General Aviation Division
Rockwell International
Cedar Rapids, Iowa 52406
(319) 395-3625 Telex: 464-421

Edo Corporation - Avionics Division
Box 610
Municipal Airport
Mineral Wells, TX 76067
(817) 325-2517 Telex: 76067

Allied Signal Corp
King Radio Division
400 North Rodgers Road
Olathe, KS 66061
(913) 782-0400 Telex: 4-2299-Kingrad

Sperry Flight Systems/Avionics Div.
8500 Balboa Blvd.P.O. Box 9028
VanNuys, CA 91409
(213) 894-8111 Telex: 65-1367

Global Navigation
2144 Michelson Drive
Irvine, CA 92715
(714) 851-0119

Narco Avionics
Ft. Washington Industrial Park
Ft. Washington, PA 19034
(215) 643-2900

B. PIPER AFCS EQUIPMENT

Early models Piper AutoPilot equipment is labeled Piper, and the appropriate Piper AutoPilot/ Flight Director Service Manual must be used.

—NOTE—

If a Roll Axis-only AutoPilot is installed, or if no AutoPilot is installed, consult Piper Pitch Trim Service Manual - 753 771 for manual electric pitch trim service information.

The following is a complete list of Piper AFCS equipment service literature. Correctly identify the AutoPilot system by faceplate model name. Each manual identifies revision level and revision status in the Master Parts Price List - Aerofiche published monthly by Piper. Consult aircraft parts catalog for replacement parts.

NAME	PIPER PART NO.
AutoControl I/II & AltiMatic I/II	753 798
AutoControl III and AltiMatic III and IIIB	753 723
AutoControl IIIB and AltiMatic IIIB-I	761 502

NAME	PIPER PART NO.
AltiMatic IIIC	761 602
AltiMatic V and V-l	761 525
AltiMatic V F/D and V F/D-1	761 526
AltiMatic X FD/AP/ and X AP	761 668
AutoFlite	753 720
AutoFlite II	761 481
Piper Pitch Trim (Manual-Electric)	757 771

— END —

CHAPTER

23

COMMUNICATIONS

1I11

CHAPTER 23 - COMMUNICATIONS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
23-00-00	GENERAL	1I13	
23-21-00	EMERGENCY LOCATOR TRANSMITTER	1I14	
23-20-00	Description	1I14	
23-20-00	Garrett Battery Removal and Installation	1H14	
23-20-00	Communications Components Corporation Battery Removal and Installation	1I15	
23-20-00	Narco 10 Battery Removal and Installation S/N' 28-7990457 thru 28-8690956, and 2890001 thru 2890139)	1I16	
23-20-00	Testing Emergency Locator Transmitter (ELT 10)	1I19	
23-20-00	Description, Operation and Testing of Pilot's Remote Switch (ELT 10 and ELT 910)	1H19	
	Narco 910 Battery Removal and Installation (S/N's 2890140 thru 2890205	I20	
23-20-00	ARTEX 110 ELT (Archer III. S/N's 2890206 and up)	1I21	
23-20-00	General Information	1I21	
23-20-00	Artex 110 ELT Battery Removal and Installation (Archer III, S/N's 2890206 and up)	1I22	
23-20-00	Testing The Artex ELT 110 Emergency Locator Transmitter	1I23	
23-80-00	AVIONICS MASTER AND EMERGENCY SWITCH CIRCUIT	1J2	
23-80-00	Description and Operation	1J2	
23-80-00	Archer II (S/N's 28-7690001 thru 28-8690056, and 2890001 thru 2890205)	1J2	
23-80-00	Archer III (S/N' 2890206 and up)	1J2	

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft .

This chapter contains information necessary to perform operational checks of the Emergency Locator Transmitter (ELT), with and without a pilot's remote switch. Included are the appropriate removal and installation instructions to facilitate battery replacement.

THIS SPACE INTENTIONALLY LEFT BLANK

EMERGENCY LOCATOR TRANSMITTER

DESCRIPTION

Electrical power for the ELT is supplied by its own self-contained battery. FAA regulations require the battery be replaced at the expiration date printed on battery, or if transmitter has been used in an emergency situation, or has more than one hour accumulated test time. To replace battery pack in transmitter, remove transmitter from aircraft. (Refer to battery removal and installation.)

GARRETT ELT BATTERY REMOVAL AND INSTALLATION (Refer to Figure 23-1.)

—CAUTION—

Inspect external whip antenna for damage. Do not bend whip. Any sharply bent or kinked whip must be replaced. Antenna damage will cause structural failure of whip in-flight

The ELT is located on mounting brackets on right side of fuselage aft of sta. 228.30.

1. Remove access plate on right side of fuselage aft of sta. 228.30.
2. Set ON/ARM/ OFF switch on transmitter to OFF position.
3. Disconnect antenna coax from transmitter.
4. Disconnect harness to pilot's remote switch.
5. Remove rear mounting bracket by pulling plastic knob out. Remove transmitter from airplane.
6. Remove two long or four short screws holding the transmitter plain end cap. Remove plain end cap.
7. Disconnect battery connector from board terminals.
8. Withdraw battery pack from transmitter case.
9. Check replacement date printed on battery before installing new battery pack. Write the date on the outside of the ELT.
10. Slide new battery pack, plain end first, into transmitter. Rotate battery slightly to properly fit in transmitter case and to achieve proper orientation of battery connector.
11. Connect battery connector to board terminals.
12. Verify O-ring is fitted in plain end cap and correctly seated. (Red ELT's have no O-ring; replace end cap using fresh RTV silicone rubber compound.)

—CAUTION—

Do not overtighten the end cap screws.

13. Refit end cap and secure with screws previously removed.
14. Place transmitter into mounting bracket. Replace rear mounting bracket by pushing plastic knob into place.
15. Connect pilot's remote switch harness to transmitter.
16. Connect antenna coax to transmitter.

—CAUTION—

Before installing access plate verify transmitter switch is in ARM position. Test unit operation before installing access panel. (Refer to testing emergency locator transmitter.)

17. Install access plate on the right side of fuselage aft of station 228.30. Write entry in aircraft log-book, include new battery run out date.

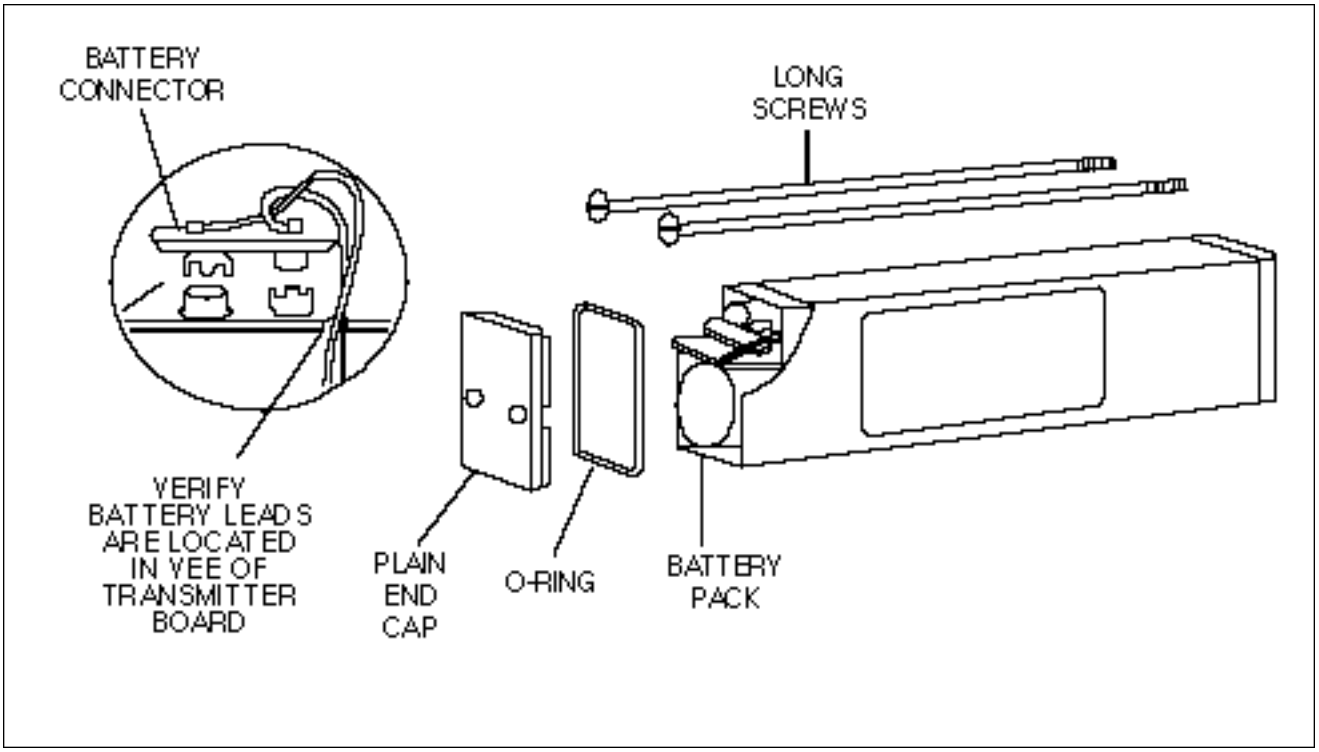


Figure 23-1. Two Year, Magnesium Battery Connections

COMMUNICATIONS COMPONENTS CORP. ELT BATTERY REMOVAL AND INSTALLATION
(Refer to Figure 23-2.)

—CAUTION—

Inspect external whip antenna for damage. Do not bend the whip. Any sharply bent or kinked whip must be replaced. Antenna damage will cause structural failure of whip in-flight.

The ELT is on the right side of airplane tail section, ahead of stabilator.

1. Remove access plate on right side of fuselage aft of sta 228.30.
2. Rotate ON/ ARM/ OFF switch to OFF position.
3. Disconnect antenna coax cable (twist left, then pull outwards).
4. Disconnect harness to pilot's remote switch.
5. Remove forward mounting bracket by pulling black plastic knob out. Remove transmitter from the airplane.
6. Remove six Phillips-head screws securing transmitter cover. Remove cover.
7. Lift out old battery pack.
8 Copy expiration date on battery into the space provided on external ELT name and date plate.
9. Disconnect and replace with new battery pack.
10. Insert transmitter into airplane and fit into place. Replace mounting bracket by pushing the black plastic knob into place.
11. Connect pilot's remote switch harness and antenna coax cable to transmitter.
12. Set ON/ARM/OFF switch to ARM position.

—CAUTION—

Test unit operation before installing access plate. (See testing emergency locator transmitter.)

13. Install access plate.
14. Write entry in aircraft logbook, include new battery run out date.

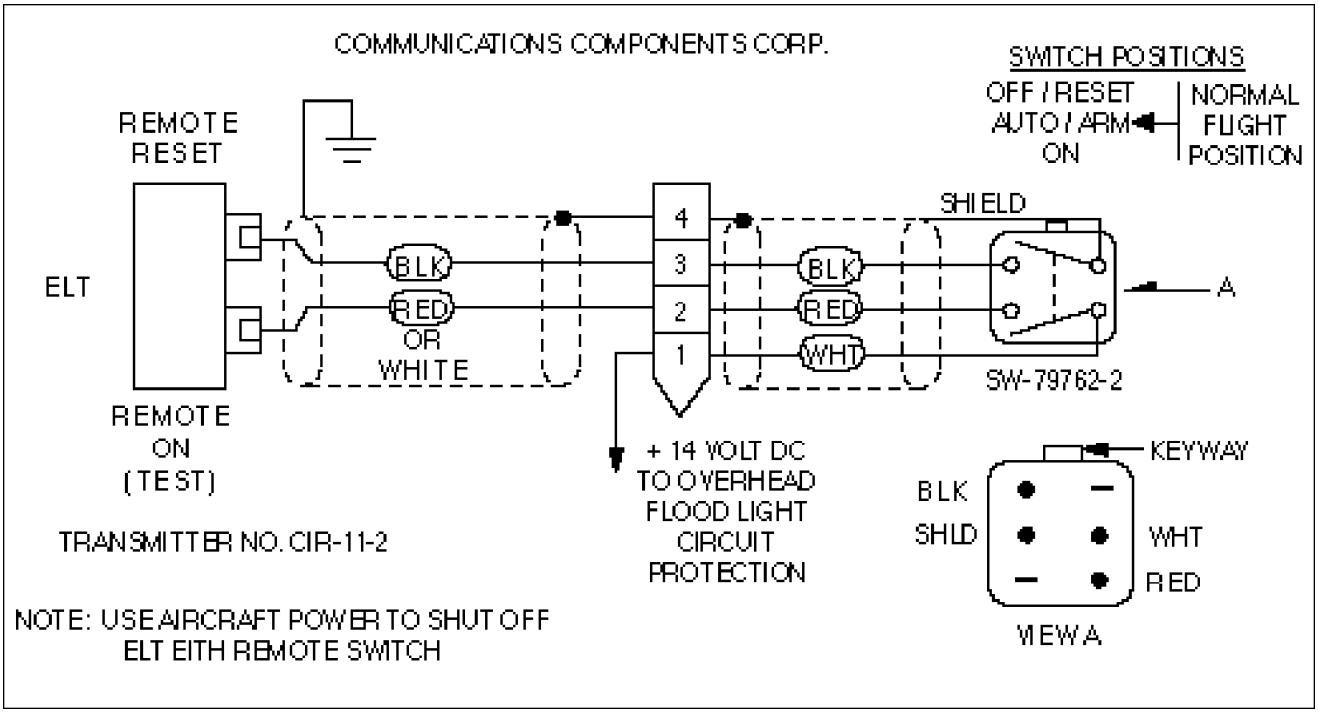


Figure 23-2. Communications Components Corporation ELT Schematic

NARCO 10 ELT BATTERY REMOVAL AND INSTALLATION (S/N's 28-7990457 thru 28-8690056, and 2879001 thru 2890139) (Refer to Figures 23-3, 23-4 and 23-5.)

1. Remove the access panel on the dorsal fin.
2. Set the ON/OFF/ARM switch on the transmitter to OFF.
3. Disconnect antenna coaxial cable from ELT.
4. Remove ELT from its mounting bracket by releasing the latch on the strap and sliding the ELT off the bracket.
5. Extend the portable antenna. (Refer to Figure 2.)
6. Unscrew the four screws that hold the control head to the battery casing and slide apart.
7. Disconnect the battery terminals from the bottom of the circuit board.
8. Discard old battery pack. (DO NOT EXPOSE TO FLAME.)

— CAUTION —

The battery pack is shipped with a sealant on the inside lip so that a water tight seal will be retained. DO NOT REMOVE THIS SEALANT.

9. Connect new battery pack terminals to the bottom of the circuit board.

10. Insert control head section into battery pack being careful not to pinch any wires. Replace the four screws. If the four holes do not line up, rotate battery pack 180° and reinsert.
11. Slide the portable antenna back into the stowed position.
12. Place transmitter into its mounting bracket and fasten the strap latch.
13. Connect the antenna coaxial cable to the ELT and ensure that the contact separator is inserted between the antenna contact finger and the portable antenna. (Refer to Figure 3.)
14. Press RESET button and set ON/OFF/ARM switch to ARM.
15. Make an entry in the aircraft logbook, including the new battery expiration date.
16. A unit operational check may now be performed on the ELT. (Refer to Testing Emergency Locator Transmitter.

— NOTE —

Inspect the external whip antenna for any damage. Avoid bending the whip. Any sharply bent or kinked whip should be replaced. Antenna damage may cause structural failure of whip in flight.

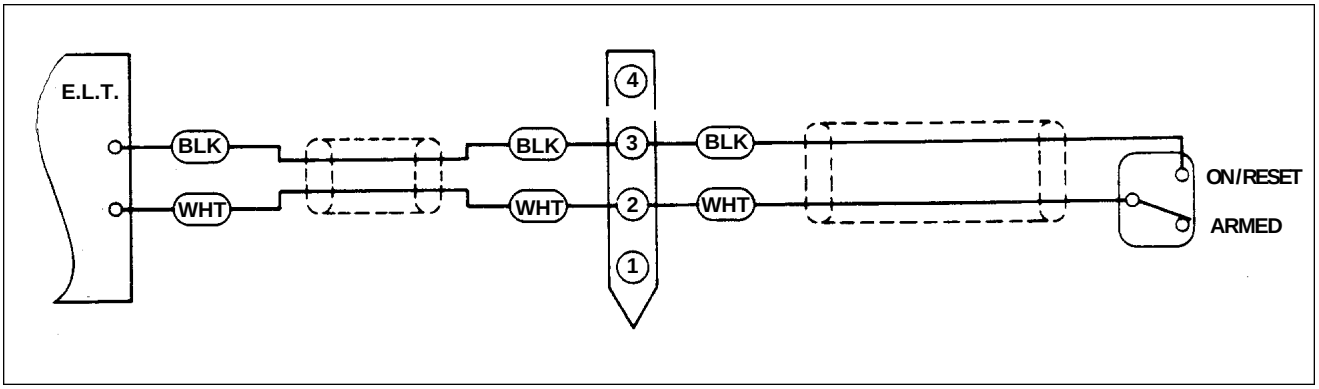


Figure 23-3. Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 1 of 2))
(S/N's 28-7990457 thru 28-8690056 and 2890001 thru 2890065)

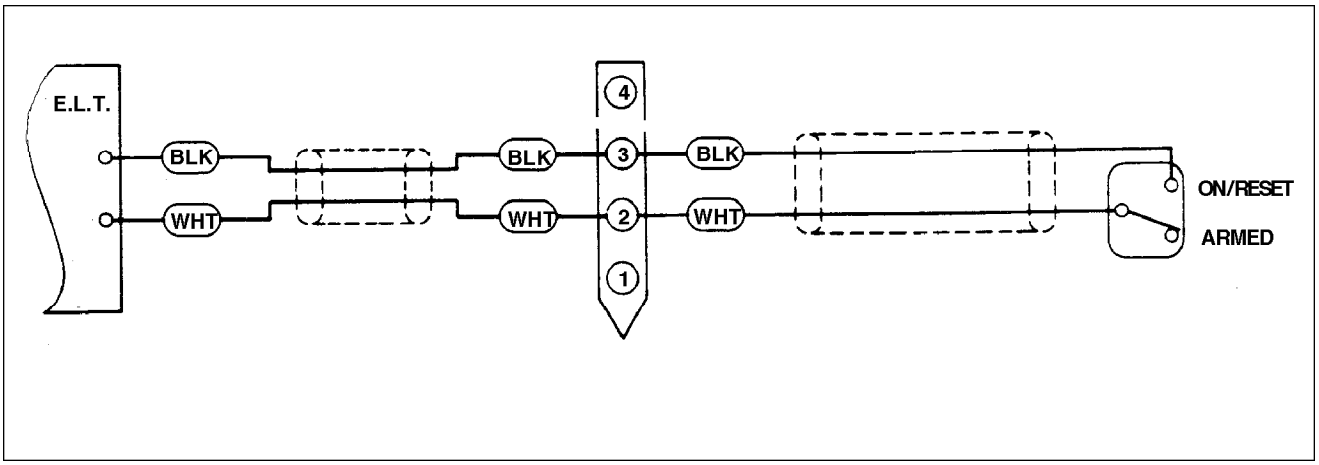


Figure 23-3. Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 2 of 2))
(S/N's 2890066 thru 2890139)

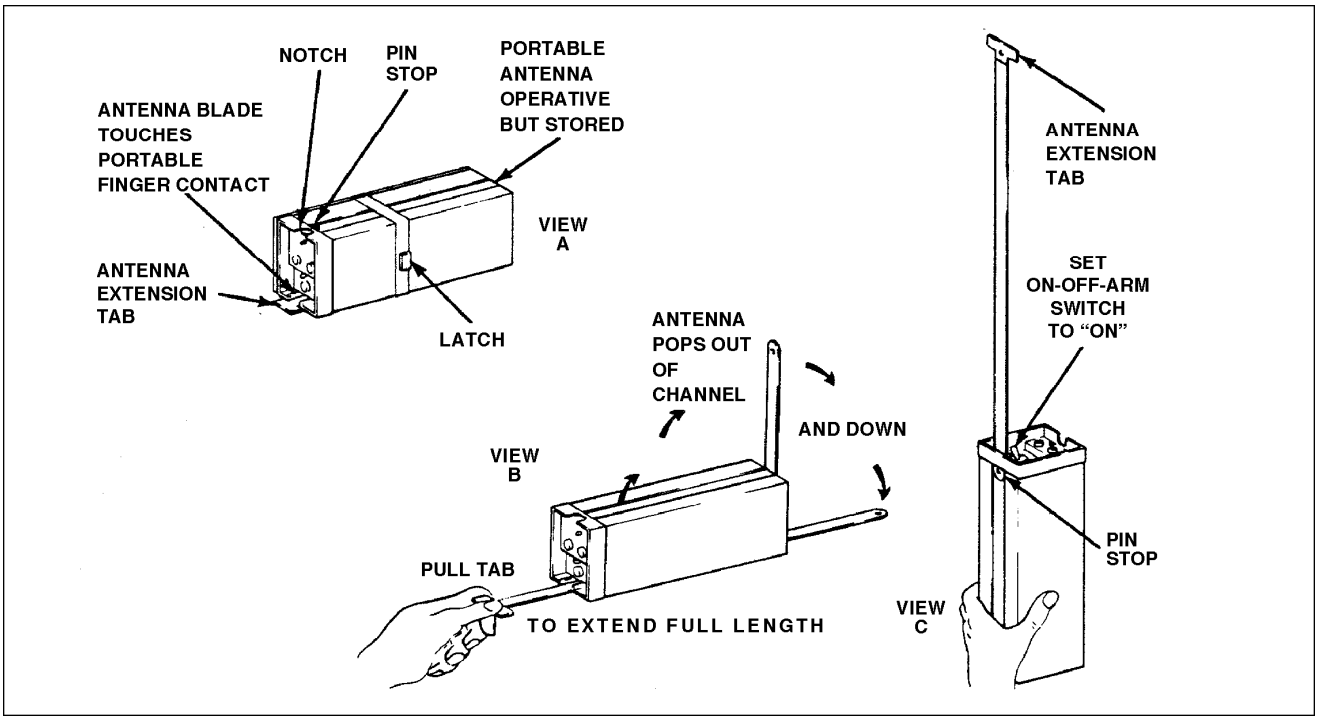


Figure 23-4. Narco ELT 10 Portable Folding Antenna

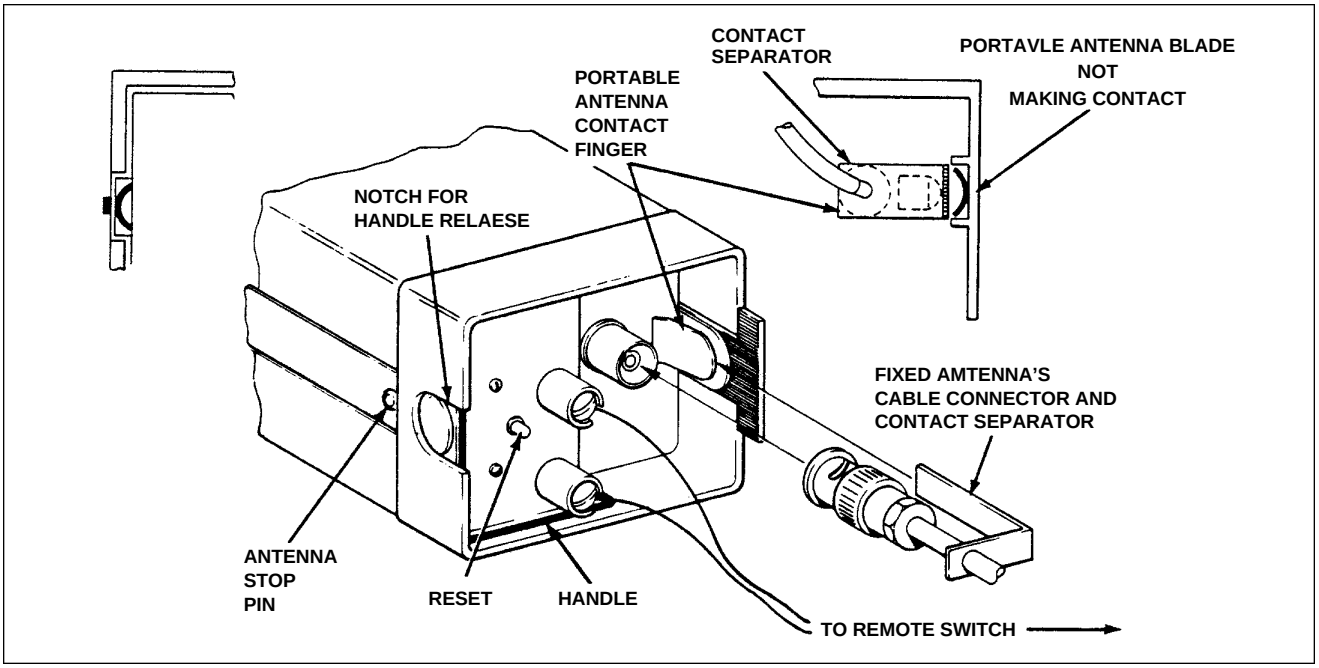


Figure 23-5. Narco ELT 10 Using Fixed Aircraft Antenna

TESTING EMERGENCY LOCATOR TRANSMITTER (ELT 10)

Conduct E .L.T. tests in a screen room or metal enclosure to ensure that electromagnetic energy is not radiated during testing. If a shielded enclosure is not available, perform tests in accordance with the following procedures:

— NOTE —

Consult FAA Advisory Circular AC 20-81 for detailed testing information and precautions

1. Conduct test only during the first five minutes after any hour.
2. If operational test must be made at any time other than the first five minutes after the hour, notify the nearest FAA traffic Control Tower or Flight Service Station prior to the test.
3. Test should be no longer than three audio sweeps.
4. If the antenna is removed, a dummy load should be substitued during the test.
   a. Remove the access panel or cover to gain access to the transmitter.
   b. Turn the aircraft master switch ON.
   c. Tune the aircraft communications receiver to 121.5 mHz and turn the volume up until a slight background noise is heard.

— NOTE —

If the aircraft is not fitted with a communications receiver, request that the nearest FAA facility listen for the E.L.T. signal.

   d. Set the ON/ARM/OFF switch ***on the transmitter*** to the ON position. Keep the switch in this position for only a few seconds; then set to the OFF position. Return to the ARM position.
   e. If ***transmitter*** is only labeled ON/ARM, set to ON position for a few seconds, then return to ARM position

— NOTE —

The test transmission should be received by the aircraft com - munications receiver and/or control tower or FAA Flight Service Station. During cold weather, there may be a slight delay before transmission occurs.

   f. A properly functioning transmitter emits a characteristic downward swept tone.
   g. When test is completed, ensure transmitter ON/ARM/OFF, or ON/ARM, switch is in the ARM position.

— NOTE —

Whenever unit is checked by moving transmitter ON/ARM/OFF switch from the ARM to ON position, it must first be moved to the OFF position before resetting to ARM position.

5. Install access panel at aft fuselage station 228.30 and secure with the appropriate screws.

DESCRIPTION, OPERATION, AND TESTING OF PILOT'S REMOTE SWITCH (ELT 10 and ELT 910)

Refer to Pilot's Operating Handbook.

NARCO 910 ELT BATTERY REMOVAL AND INSTALLATION (S/N's 2890140 thru 2890205) (Refer to Figures 23-6 and 23-7.)

1. Remove access panel located at fuselage station 228.30.
2. Set ON/OFF/ARM switch on ***transmitter*** to OFF.
3. Disconnect antenna coaxial cable from ELT.
4. Disconnect wiring harness connector from ELT.
5. Remove ELT from its mounting tray.
6. Remove 8 flat head screws from unit. (Refer to Figure 6.)
7. ***Carefully*** separate unit into two sections.
8. Unsnap battery connector (connector toward back end of circuit board). (Refer to Figure 6.)
9. ***Carefully*** remove battery pack (contained in white foam jacket) from the ELT.
10. Cut tape holding the two halves of foam together and remove old battery pack.
11. Install new battery pack in foam jacket. Tape foam halves together with a good quality glass filament tape.
12. Install battery pack assembly into ELT. Plug connector into circuit board.
13. Slide the two unit section together. Ensure red gasket in header is sitting flat.
14. Secure with 8 new screws provided with replacement battery. Ensure all 8 screws are snugged up.
15. Install ELT into tray in airplane. Perform tests as specified below.

— NOTE —

Inspect the external whip antenna for any damage. Avoid bending the whip. Any sharply bent or kinked whip should be replaced. Antenna damage may cause structural failure of whip in flight.

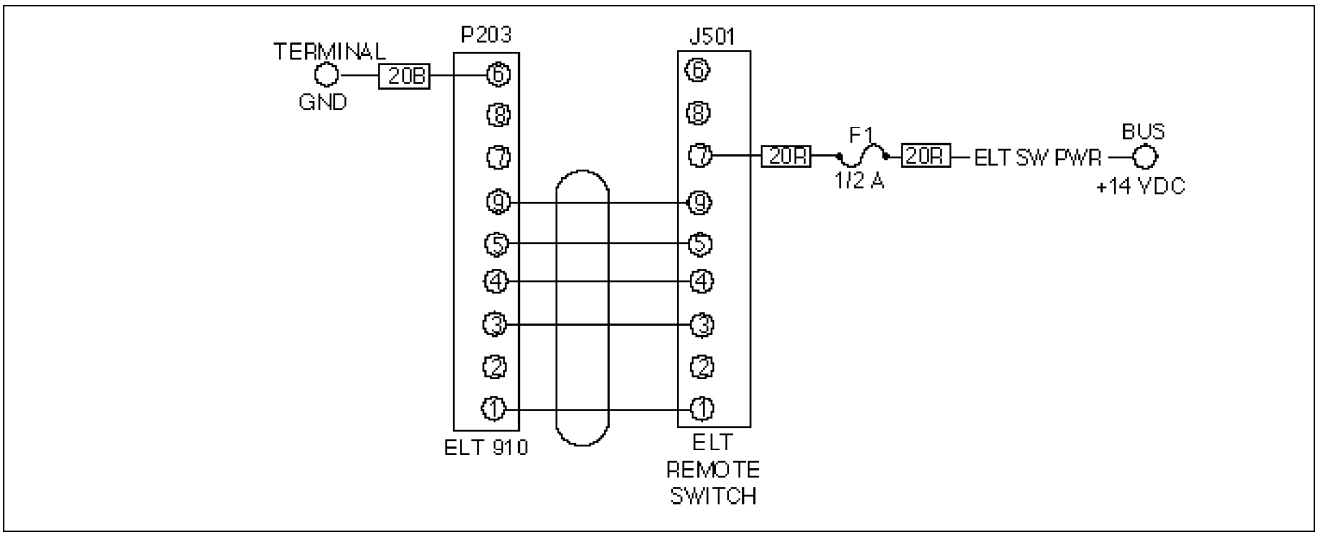


Figure 23-6. Narco ELT 910 Emergency Locator Transmitter Schematic (S/N's 2890140 thru 2890205)

TESTING ELT 910 EMERGENCY LOCATOR TRANSMITTER

— NOTE —

Consult FAA Advisory Circular AC 20-81 for detailed testing information and precautions

1. Conduct test only during the first five minutes after any hour.

2. If operational test must be made at any time other than the first five minutes after the hour, notify the nearest FAA traffic Control Tower or Flight Service Station prior to the test.
3. Test should be no longer than three audio sweeps.
4. If the antenna is removed, a dummy load should be substituted during the test.
   a. Remove access panel or cover to gain access to transmitter.
   b. Turn aircraft master switch ON. Turn the aircraft communications receiver ON and tune to 121.5 mhz.
   c. Turn receiver volume up until a slight background noise is heard. If equipped, automatic squelch must be overridden.
   d. If aircraft is not fitted with a communications receiver, request the nearest FAA facility to listen for E.L.T. signal.
   e. Set ON/ARM/OFF switch ***on the transmitter*** to the ON position for approximately 2 seconds. Return to OFF, then ARM position.
   f. Test transmission should be received by aircraft communications receiver and/or FAA facility. During cold weather, there may be a slight delay before transmission occurs.
   g. A properly functioning transmitter emits a characteristic downward swept tone.
   h. When test is completed, ensure transmitter ON/ARM/OFF is in the ARM position. Whenever unit is checked by moving transmitter ON/ARM/OFF switch from ARM to ON position, it must first be moved to OFF position before resetting to ARM position.
5. Install access panel on dorsal fin aft of fuselage station 259.30 and secure with the appropriate screws.

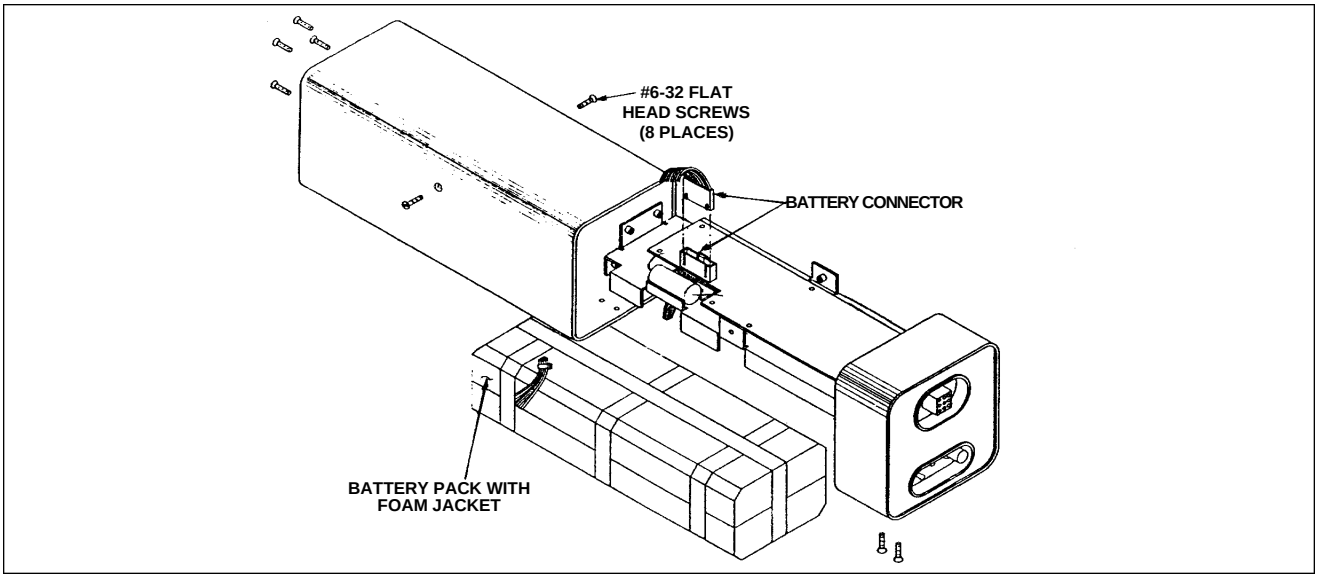


Figure 23-7. ELT 910 Battery Pack (S/N's 2890140 thru 2890205)

ARTEX 110 E. L. T. (Archer III, S/N's 2890206 and up)

GENERAL INFORMATION

The Artex ELT-110 transmits on 121.5 hmHz and 243.0 mHz, and is designed to meet or exceed the requirements of TSO C91a and FAR Part 91.

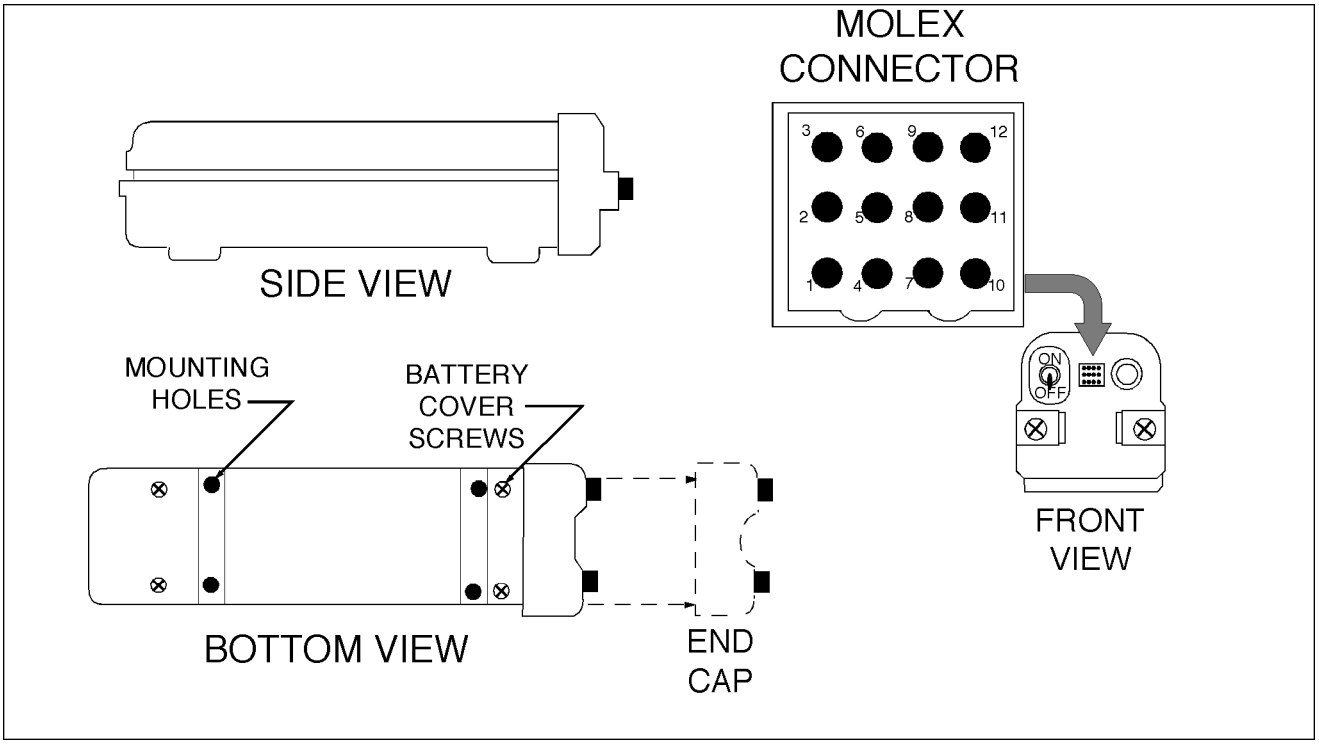


Figure 23-8. Artex 110 E. L. T.

The Artex 110 cannot be accidently activated by dropping the unit, handling it roughly, or during shipping. However, when properly mounted, and locked into its mounting tray, the E. L. T. will activate in a crash, regardless of the cockpit remote switch and E. L. T. switch position. The ***normal*** position of the E. L. T. switch is in the down or OFF position. The ***normal*** position of the remote cockpit switch is in down or ARM position

Whenever the E. L. T. is activated, a red light located just above the remote cockpit switch will blink to alert the pilot or maintenance personnel. Should the E. L. T. be activated accidently, it must be reset. To reset:

1. Position the remote cockpit switch to ON, then ***immediately*** repositioning it to ARM, or;
2. Position the switch on the E. L. T. to ON, then ***immediately*** repositioning it to OFF.

ARTEX 110 ELT BATTERY REMOVAL AND INSTALLATION (Archer III, S/N's 2890206 and up) (Refer to Figures 23-8 and 23-9)

1. Disconnect and remove positive cable from battery.
2. Remove E. L. T. from the airplane by:
   a. Loosening the two screws on the front of the mounting tray and pull mounting tray cap off.
   b. Disconnecting coax (antenna) cable.
   c. Disconnecting the Molex cable from the E. L. T. unit.
   d. Remove unit from airplane.
2. Remove the four screws on the bottom of the E.L.T. securing the battery pack.
3. Disconnect battery pack connector from main unit.
4. Remove battery pack from unit.
5. Securely plug in new battery pack connector to main unit.
6. ***Immediately*** reset unit by positioning unit switch to ON, then to OFF.
7. Fit new battery pack into place. Ensure all gaskets are properly aligned.

8. Replace the four screws. Dress wires away from standoffs to avoid pinching wires between standoffs and the battery pack.
9. Install unit into mounting tray:
   a. Connect molex and coax cables to ELT unit.
   b. Install mounting tray cap and secure to front of mounting tray with the two screws.
11. Install positive cable to battery.
10. Test transmitter.

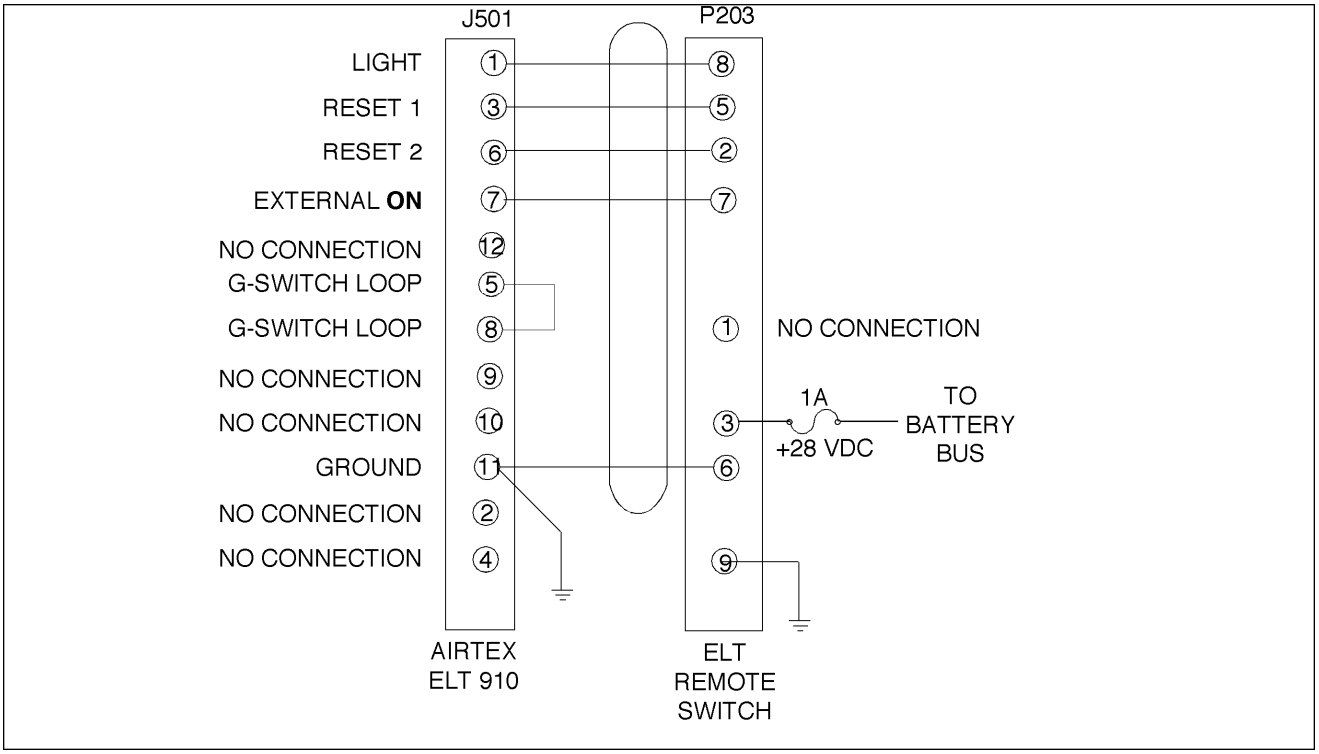


Figure 23-9. Artex E. L. T. 110 Wiring Schematic

TESTING THE ARTEX ELT 110 EMERGENCY LOCATOR TRANSMITTER

— NOTE —

Consult FAA Advisory Circular AC 20-81 for detailed testing information and precautions

1. Conduct test only during the first five minutes after any hour.
2. If operational test must be made at any time other than the first five minutes after the hour, notify the nearest FAA traffic Control Tower or Flight Service Station prior to the test.
3. Test should be no longer than three audio sweeps.
4. Tune airplane communications receiver to 121.5 mHz. Check that aircraft battery and radio master switches are ON.
5. Position ELT cockpit switch to ON. The ELT should ***immediately*** begin signaling and the panel light should ***immediately*** come ON. Although the light may illuminate after a few seconds, failure of the light to ***immediately*** come ON indicates trouble with the g-switch circuit, pins 5 and 8 on tray connector, and that the unit is not working properly. Repairs should be done only by a licensed aviation radio repair shop.

GRIDS 1I24 THROUGH 1J1
INTENTIONALLY LEFT BLANK

AVIONICS MASTER AND EMERGENCY SWITCH CIRCUIT (Refer to figure 9l-l5, chapter 9l.)

DESCRIPTION AND OPERATION

Archer II (S/N's 28-7690001 thru 28-8690056. and 2890001 thru 2890205)

Electrical power for various avionics components is controlled by the avionics master switch near the top of the instrument panel between radio stacks. It controls power to all radios through aircraft master switch.

An emergency bus switch is also provided for auxiliary power to avionics bus if the radio master switch circuit fails. The emergency bus switch is behind the lower right shin guard to the left of the circuit breaker panel.

Archer III (S/N's 2890206 and up)

Electrical power for various avionics components is controlled by the RADIO MASTER rocker type switch located in the center instrument panel just below the radios. The battery master (BATT MASTR), located in the overhead switch panel, must also be ON in order to provide power to the RADIO MASTER switch. An emergency bus switch is not required on the Archer III.

— END —

CHAPTER

24

ELECTRICAL POWER

1J3

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
	— NOTE —		
	Refer to Chapter 91 for all Wiring Diagrams (Schematics).		
24-00-00	GENERAL	1J7	
24-00-00	Description and Operation	1J7	
24-00-00	Archer II (S/N's 28-7690001 thru 28-8190264)	1J7	
24-00-00	Archer II (S/N's 28-8190265 thru 28-8690056 and 2890001 thru 2890205)	1J7	
	Archer III (S/N's 2890206 and up)	1J7	
24-00-00	Troubleshooting	1J8	
24-30-00	DC GENERATION	1J14	
24-30-00	Precautions	1J14	
24-30-00	Prestolite 14 Vdc, 60 amp Alternator System (Archer II)	1J15	
24-30-00	Description of Prestolite Alternator	1J15	
24-30-00	Checking Prestolite Alternator System	1J17	
24-30-00	Prestolite Alternator Service Procedures	1J18	
24-30-00	Overhaul of Prestolite Alternator	1J18	
24-30-00	Disassembly of Prestolite Alternator	1J19	
24-30-00	Inspect and Test Components of Prestolite Alternator	1J19	
24-30-00	Assembly of Prestolite Alternator	1J21	
24-30-00	Testing Prestolite Alternator	1J23	
24-30-00	Prestolite Alternator Service Tips	1J23	
24-30-00	Prestolite Alternator Service Test Specifications	1K1	
24-30-00	Chrysler 14 Vdc, 60 amp Alternator System (Archer II)	1K2	
24-30-00	Description of Chrysler Alternator System	1K2	
24-30-00	Checking Chrysler Alternator System	1K4	
24-30-00	Overhaul of Chrysler Alternator	1K4	
24-30-00	Chrysler Alternator Rotor Field Coil Current Draw	1K5	
24-30-00	Testing Chrysler Alternator Internal Field Circuit	1K5	

CHAPTER 24 - ENVIRONMENTAL SYSTEM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
24-30-00	D.C. GENERATION (cont.)	—	
24-30-00	Alternator System (Chrysler) (cont.)	—	
24-30-00	Inspection of Chrysler Alternator	1K6	
24-30-00	Testing of Rectifier Assemblies	1K7	
24-30-00	Testing of Positive Rectifiers Using C-3829 Tester	1K7	
24-30-00	Testing of Negative Rectifiers Using C-3829 Tester	1K8	
24-30-00	Testing of Rectifier Assemblies Using Test Lamp	1K8	
24-30-00	Removal of Chrysler Alternator Rectifier and Heatsink Assembly	1K9	
24-30-00	Testing of Chrysler Alternator Stator	1K10	
24-30-00	Removal of Chrysler Alternator Pulley and Bearing	1K10	
24-30-00	Testing of Chrysler Alternator Rotor	1K12	
24-30-00	Chrysler Alternator Slip Rings	1K12	
24-30-00	Assembly of Chrysler Alternator	1K12	
24-30-00	Electrosystems 28 Vdc, 70 Amp Alternator (Archer III)	1K17	
24-30-00	Description of Electrosystems Alternator	1K17	
24-30-00	Checking Electrosystems Alternator System	1K18	
24-30-00	Electrosystems Alternator Service Procedures	1K20	
24-30-00	Overhaul of Electrosystems Alternator	1K20	
24-30-00	Disassembly of Electrosystems Alternator	1K21	
24-30-00	Inspect and Testing Components of Electrosystems Alternator	1K22	
24-30-00	Assembly of Electrosystems Alternator	1K24	
24-30-00	Testing Electrosystems Alternator	1L2	
24-30-00	Electrosystems Alternator Service Tips	1L2	
24-30-00	Electrosystems Alternator Service Test Specifications	1L3	
24-30-00	Checking Alternator Belt Tension	1L4	
24-30-00	Battery	1L5	
24-30-00	Archer II	IL5	
24-30-00	Servicing Battery	1L5	
24-30-00	Removal of Battery	1L5	

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
24-30-00	D.C. GENERATION (cont.)	—	
24-30-00	Battery (cont.)	—	
24-30-00	Archer II (cont.)	—	
24-30-00	Installation of Battery	1L5	
24-30-00	Testing Battery	1L6	
24-30-00	Charging Battery	1L6	
24-30-00	Battery Box Corrosion Prevention	1L6	
24-30-00	Archer III (S/N's 2890206 and up)	1L7	
24-30-00	Battery Removal	1L7	
24-30-00	Removing Acid Recovery (Vent) Jar	1L7	
24-30-00	Cleaning Battery	1L8	
24-30-00	Cleaning and Recharging Acid Recovery (Vent) Jar	1L8	
24-30-00	Battery Installation	1L8	
24-30-00	Installing Acid Recovery (Vent) Jar	1L9	
24-30-00	Battery Charging-(Gill Model G-243)	1L9	
24-30-00	Hydrometer Reading and Battery Charge	1L10	
24-30-00	Battery Discharge	1L11	
24-30-00	Battery Temperature Considerations	1L12	
24-30-00	Battery Repairs, Storage, and Service Tips	1L12	
24-30-00	Preparing New Dry Charged Battery for Installation	1L13	
24-30-00	Checking Voltage Regulator	1L13	
24-30-00	To Test 14 Volt Regulator	L14	
24-30-00	14 Vdc System Regulator Over-voltage Check	1L15	
24-30-00	Checking Overvoltage Relay (14 Vdc System Only)	1L15	
24-30-00	To Test 28 Volt Regulator	L16	
24-30-00	28 Vdc System Regulator Over-voltage Check	1L16	
24-40-00	EXTERNAL POWER	1L20	
24-41-00	External Power Receptacle Operation	1L20	
24-50-00	ELECTRICAL SYSTEM LOAD DISTRIBUTION	1L22	
24-50-00	Archer II	1L22	
24-50-00	Archer III (S/N's 2890206 and up)	1L22	

GENERAL

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

This chapter contains instructions for correcting difficulties which may arise in electrical system operation. Included is a general description and function of each part of the system along with test and adjustments of various components.

A. DESCRIPTION AND OPERATION

Archer II (S/N' 28-7690001 thru 28-8190264)

The electrical system is a 14-volt, direct current, single wire, negative ground system. All electrical equipment is grounded to the metal structure of airplane. The structure takes the place of a second wire. A 12-volt battery is incorporated into the system to furnish power for starting and as a reserve power source in case of alternator failure. The battery and 60 amp alternator are connected to the bus bar that powers all electrical equipment, except the starter, which receives its power direct from battery. The master (BAT) and alternator (ALT) switch is a split interlocked switch that controls the battery relay and alternator field circuit. One half of the split switch (ALT) may used to turn OFF the alternator field in the event of alternator failure. The other half of the split switch is the master (BAT) switch, which must be ON before any electrical equipment will operate. When the BAT switch is turned OFF, the interlocked ALT switch will also be positioned in the OFF position. A warning light on the annunciator panel will illuminate if the alternator fails to produce current, accompanied by a zero indication on the ammeter.The airplane can be equipped with standard navigation lights, rotating beacon, and one landing light located in nose cowling.

Archer II (S/N' 28-8190265 thru 28-8690056 and 2890001 thru 2890205)

The electrical system is a 14-volt, direct current, single wire, negative ground system. All electrical equipment is grounded to the metal structure of airplane. The structure takes the place of a second wire. A 12-volt battery is incorporated into the system to furnish power for starting and as a reserve power source in case of alternator failure. The battery and 60amp alternator are connected to the bus bar that powers all electrical equipment, except the starter, which receives its power direct from battery. The master (BAT) and alternator (ALT) switch is a split switch that controls the battery relay and alternator field circuit. One half of the split switch (ALT) may used to turn OFF the alternator field in the event of alternator failure. The other half of the split switch is the master (BAT) switch, which must be ON before any electrical equipment will operate. These switches are ***not*** interlocked and can be positioned to the ON or OFF positions independently. A warning light on the annunciator panel will illuminate if the alternator fails to produce current, accompanied by a zero indication on the ammeter. The airplane can be equipped with standard navigation lights, rotating beacon, and one landing light located in nose cowling**.**

Archer III (S/N's 2890206 and up)

The electrical system is a 28-volt, direct current, single wire, negative ground system. All electrical equipment is grounded to the metal structure of airplane. The structure takes the place of a second wire.

A 24-volt battery is incorporated into the system to furnish power for starting and as a reserve power source in case of alternator failure. The battery and 75 amp alternator are connected to the bus bar that powers all electrical equipment, except the starter, which receives its power direct from battery. The battery relay and alternator field circuit are controlled by independent rocker type master (BATT MASTR) and alternator (ALTR) switches located in the overhead switch panel. The alternator switch (ALT) may used to turn OFF the alternator field in the event of alternator failure. A warning light on the annunciator panel will illuminate if the alternator fails to produce current, accompanied by a zero indication on the ammeter. A low voltage warning light on the annunciator panel will illuminate when alternator output is lost and the system is drawing power from the battery alone. The master (BAT) switch must be ON before any electrical equipment will operate. The airplane is equipped with standard navigation lights and wing tip strobe type anti-collision lights, which are controlled by rocker type switches (NAV LIGHT and STROB LIGHT) located in the overhead switch panel. The airplane is also equipped with two landing light; one located in each wing. The right wing landing light may also be used as a taxi light. These lights are controlled by a rocker type switch (TAXI-OFF-LAND LIGHT) located in the overhead switch panel.

B. TROUBLESHOOTING

— WARNING —

All checks and adjustments of alternator and components must be made with engine stopped. To complete some checks or adjustments, remove these units from airplane and place on a test stand.

— CAUTION —

Do not use aluminum cable to repair wiring. If there is a fault in the aluminum cable, the complete cable assembly must be replaced with copper wire and suitable terminals. Aluminum cable wiring was used in: battery circuit, battery to ground, battery to master relay, master relay to starter solenoid, starter solenoid to starter, and engine return ground wire to airframe (see individual schematics). (Refer to latest revision of Piper Service Bulletin NO. 836A.)

Troubles peculiar to the alternator system are listed in Chart 2401 with probable causes and suggested remedies. Troubles peculiar to the battery system are listed in Chart 2402 with probable causes and suggested remedies. Wiring diagrams included at the end of this section give a physical breakdown of electrical circuits in this airplane.

After trouble is corrected, check entire electrical system for security and operation of its components.

THIS SPACE INTENTIONALLY LEFT BLANK

CHART 2401. TROUBLESHOOTING ALTERNATOR (SHEET 1 of 4)

TROUBLE	CAUSE	REMEDY
Zero output indicated on ammeter regardless of rpm (refer to alternator system test procedure).	Open field circuit.	With master switch turned on, check for battery voltage from airplane's main buss through entire field circuit to alternator field terminal. Measure voltage from ground (-) to following points (+) in sequence: bus bar, field circuit breaker (5A), field terminals of master switch, voltage regulator, and alternator field terminal. Interruption of voltage through any of these points isolates faulty component or wire which must be replaced. (See wiring schematic.)
	Open output circuit.	With master switch turned on, check for battery voltage from airplane's main bus through entire output circuit to alternator battery post. Measure voltage from ground (-) to following points (+) in sequence: bus bar, ammeter, and alternator battery post. Interruption of voltage through any of these points isolates faulty component or wire which must be replaced. (See wiring schematic, chapter 91.) Open circuit in alternator output will usually burn out ALT annunciator lamp and 50 ohm resistor. Check 5A inline fuse.
	Open field winding in alternator.	Disconnect field terminal of alternator from field wiring. Check continuity from field wiring field terminal to ground with ohmmeter (20-100 ohms) depending on brush contact resistance.

CHART 2401. TROUBLESHOOTING ALTERNATOR (2 of 4)

TROUBLE	CAUSE	REMEDY
Zero output reading on ammeter regardless of rpm (refer to alternator system test procedure). (cont.)	Open field winding in alternator. (cont.)	***— WARNING —*** ***Turn magneto switch to off and ensure magneto is grounded before turning propeller by hand.*** Pull propeller slowly by hand turning alternator rotor through 360 of travel. If resistance is high, check brushes for spring tension and excessive wear; replace if necessary. If brushes are good and field reads open, replace alternator.
Output reading on ammeter does not meet minimum values specified in alternator system test procedure.	Faulty voltage regulator.	Start engine, turn on load (refer alternator test procedure), set throttle at 2300 rpm Check voltage at bus bar (convenient check point, remove cigar lighter and check from center contact (+) to ground (-). Voltage must be 13.5 volts minimum. If voltage is below this value, replace regulator.
	High resistance connections in field or output circuit	Inspect for loose binding posts at various junction points in system, alternator battery post, lugs on ammeter, connections at voltage regulator, circuit breaker, etc. (See wiring schematic, Chapter 91.) Examine crimped terminal ends for signs of deterioration at crimp or strands of broken wire at crimp. Tighten any loose binding posts. Replace bad wire terminals.
	Open rectifier.	If any of the six rectifiers open up internally, it will result in a definite limitation on the current that can be drawn from alternator. Check previous causes of low output, verify a faulty rectifier exists. See paragraph titled inspection and testing of components.

CHART 2401. TROUBLESHOOTING ALTERNATOR (3 of 4)

TROUBLE	CAUSE	REMEDY
Field circuit breaker trips.	Short circuit in field circuit.	Disconnect field wiring at altemator terminal. Turn on master switch. If breaker continues to trip, disconnect each leg of field circuit, working from alternator towards circuit breaker until breaker can be reset and will hold. Replace defective component or wire. (See wiring schematic, chapter 91.)
	Short circuit in field winding of alternator.	Disconnect field wiring at alternator terminal. Turn on master switch. Reset breaker and if breaker fails to retrip, this isolates short circuit to field of alternator. Check brush holders for shorting against frame. If there are no obvious signs of a physical short circuit at field terminal or brush holder, replace alternator. (Note: Intermittent short circuit.) ***— CAUTION —*** ***Turn magneto switch off before turning propeller.*** Internal short circuiting of the field will occur at various positions of rotor. Reconnect field, set breaker, pull propeller slowly by hand turning alternator rotor through 360 of travel. Observe circuit breaker for signs of tripping.
Ammeter reads 60 amps (Archer II), or 70 amps (Archer III) at 1400 rpm and above, ALT annunciator light on.	Short to ground in alternator output wiring.	On Archer II, check condition of Teflon insulators on feet of diode heat sink. When mounting screws are over torqued, they will cut through insulators causing a short to ground. On Archer III, check wiring for short to ground. Both models, check other wiring for chafing, etc.

CHART 2401. TROUBLESHOOOTING ALTERNATOR (4 of 4)

TROUBLE	CAUSE	REMEDY
Battery installed with reversed polarity.	Battery charged backwards.	Remove battery and install with correct polarity. Remove battery. Connect load such as landing light, lamp, or similar load, and discharge battery. Charge with correct polarity and test each cell for signs of damage due to reversed charging. ***— NOTE —*** ***This condition above can only occur where a discharged battery has been removed from airplane and put on a charger with polarity reversed. This reversal in polarity cannot occur in airplane due to a faulty alternator system.***
Excessive ammeter fluctuation.	Excessive resistance in field circuit.	Check all connections and wire terminals in field circuit for deterioration such as loose binding posts, broken wire strands at terminals, etc. Tighten all connections and replace faulty terminals.
	High field circuit resistance	If problem persists, jump across terminals of the following components one at a time until the faulty unit is isolated. a. Field 5 amp (alternator) circuit protector. b. Alternator half of master switch. c. Overvoltage relay.
	Defective voltage regulator.	Replace voltage regulator.

CHART 2402. TROUBLESHOOTING BATTERY

TROUBLE	CAUSE	REMEDY
Discharged battery.	Battery worn out.	Replace battery.
	Improper charging rate.	Adjust voltage regulator
	Standing too long.	Remove and charge battery if left in unused airplane three weeks or more.
	Equipment left on accidentally.	Remove and charge battery.
	Impurities in electrolyte.	Replace battery.
	Short circuit (ground) in wiring.	Check wiring.
	Broken cell partitions.	Replace battery.
Battery life is short.	Overcharge due to level of electrolyte being below top of plates.	Maintain proper electrolyte level.
	Sulfation due to disuse.	Replace battery.
	Impurities in electrolyte.	Replace battery.
	Low charging rate.	Adjust voltage regulator.
Cracked cell partition(s).	Hold-down bracket loose.	Replace battery and tighten.
	Frozen battery.	Replace battery.
Compound on top of battery melts.	Charging rate too high.	Reduce charging rate by adjusting voltage regulator or replace transistorized regulator.
Electrolyte runs out of vent plugs.	Too much water added to battery and charging rate too high.	Drain and keep at proper level. Adjust voltage regulator.
Excessive corrosion inside container.	Spillage from over filling.	Use care in adding water.
	Vent lines leaking or clogged.	Repair or clean.
	Charging rate too high.	Adjust voltage regulator.
Battery freezes.	Discharged battery.	Replace.
	Water added and battery not charged immediately.	Always recharge battery for 1/2 hour following addition of water in freezing weather.
Battery polarity reversed.	Connected backwards on charger.	Battery must be slowly discharged completely and then charged correctly and tested.
Battery consumes excessive water.	Charging rate too high (if in all cells).	Correct charging rate.
	Cracked partition (one cell only).	Replace battery.

DC GENERATION

PRECAUTIONS

The following precautions must be observed when testing or servicing the electrical system. Failure to observe these precautions will result in serious damage to the electrical equipment.

— CAUTION —

Refer to wiring diagram (refer to figure 24-13) when installing or testing alternator.

— CAUTION —

Disconnect battery before connecting or disconnecting test instruments, except voltmeter, or before removing or replacing any unit or wiring. Accidental grounding or shorting at regulator, alternator, ammeter, or accessories, will cause severe damage to units and/or wiring.

— CAUTION —

The output lead must not be removed from alternator while rotor winding is energized and alternator is operating.

— CAUTION —

Do not attempt to polarize alternator. No polarization is required. Any attempt to do so could damage alternator, regulator, or circuits.

— CAUTION —

Grounding alternator output terminal will damage alternator and/or circuit and components.

— CAUTION —

Reversed battery connections will damage rectifiers, wiring, and other charging system components. Battery polarity must be checked with a voltmeter before connecting battery. This aircraft is negative ground.

— CAUTION —

If booster battery or fast charger is used, its polarity must be connected correctly to prevent damage to electrical system components.

— CAUTION —

Do not use aluminum cable to repair wiring. If there is a fault in the aluminum cable, the complete cable assembly must be replaced with copper wire and suitable terminals. Aluminum cable wiring was used in: battery circuit, battery to ground, battery to master relay, master relay to starter solenoid, starter solenoid to starter, and engine return ground wire to airframe (see individual schematics). (Refer to latest revision of Piper Service Bulletin No. 836A.)

A. PRESTOLITE 14 VDC, 60 AMP ALTERNATOR SYSTEM (ARCHER II)

1. Description Of Prestolite Alternator (Refer to Figure 24-1.)

The principal alternator components are: brush holder assembly, slip ring end head, rectifiers, stator, rotor, and drive end head.

a. The brush and holder assembly contains two brushes, two brush springs, a brush holder, and insulator. One brush is connected to a terminal stud and insulated from ground. The other brush is connected to ground through brush holder. Brush and holder assembly are easily removed for inspection or brush replacement.

b. The slip ring end head provides mounting for rectifiers and rectifier mounting plate, output and auxiliary terminal studs, and brush and holder assembly. Slip ring end head contains a roller bearing, outer race assembly, and a grease seal.

c. The rectifiers used are rated at minimum 150 peak inverse voltage for transient voltage protection. Three positive rectifiers are mounted in rectifier mounting plate while three negative rectifiers are mounted in slip ring end head. Each rectifier pair is connected to stator lead with high temperature solder. Stator leads are anchored to rectifier mounting plate with epoxy cement for vibration protection.

d. The stator contains a special lead connected to center of the three phase windings and is used to activate low voltage warning systems or relays. The stator is treated with a special epoxy varnish for high temperature resistance.

e. The rotor contains slip ring end bearing inner race, and spacer on slip ring end of shaft. Rotor winding and winding leads are specially treated with high temperature epoxy cement to provide vibration and temperature resistance characteristics. High temperature solder is used to secure winding leads to slip rings.

f. The drive end head supports a sealed, prelubricated ball bearing in which drive end of rotor shaft rotates.

Island Enterprises

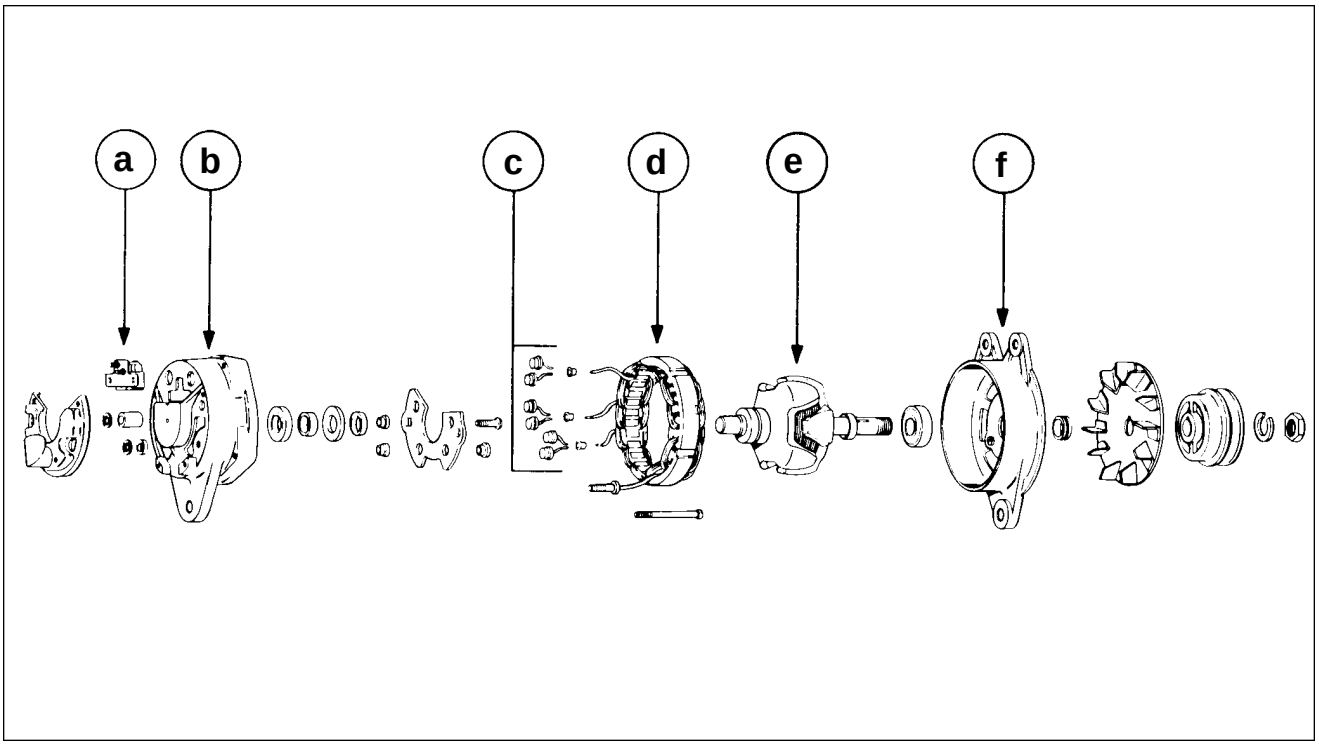


Figure 24-1. Exploded View of Prestolite Alternator

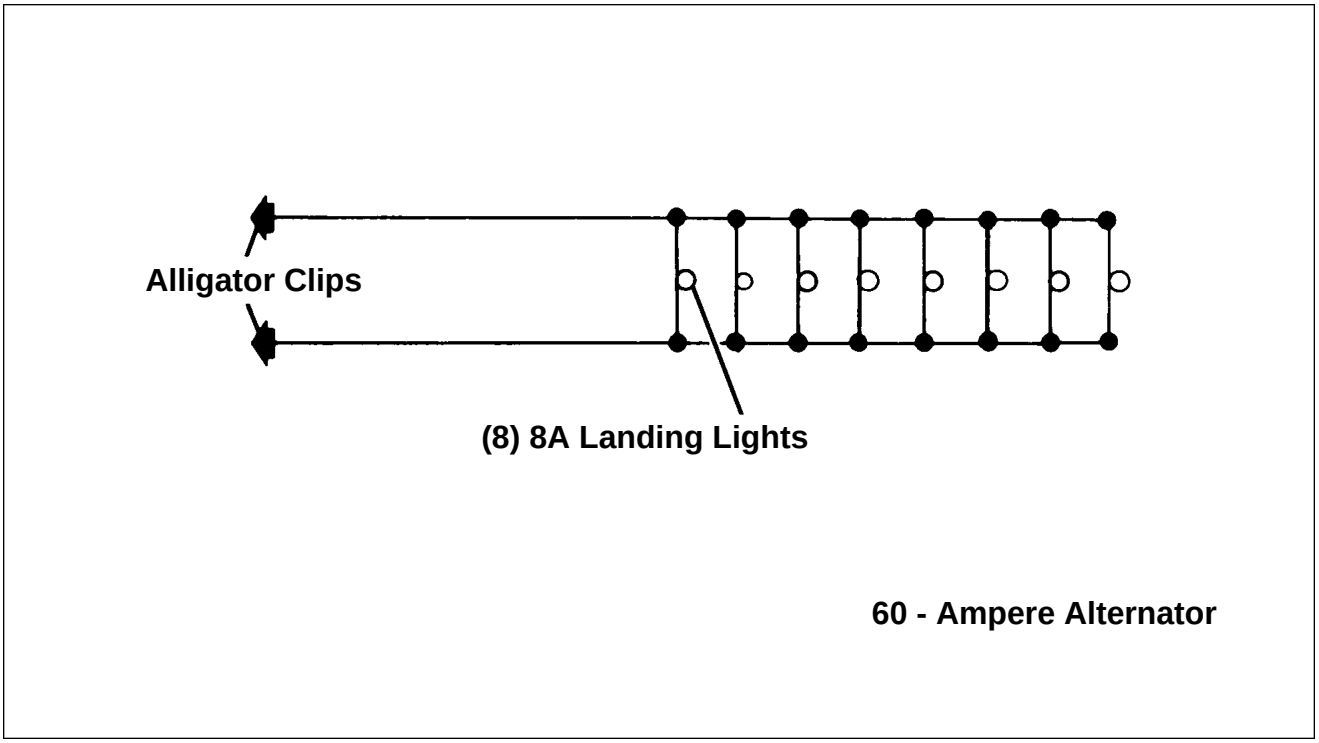


Figure 24-2. Lamp-Bank Load

2. Checking Prestolite Alternator System

With electrical equipment off (except master switch) the ammeter will read amount of charging current demanded by battery. The amount will vary, depending on percentage of battery charge. As battery is charged, current displayed on ammeter will reduce to approximately two amperes. Current reading on ammeter will show if alternator system is operating normally.

— NOTE —

Current reading on ammeter is the load in amperes demanded by the electrical system from alternator. Check, for example, a condition where battery is demanding 10 amperes charging current, then switch on landing light. Note value in amperes placarded on circuit breaker panel for landing light circuit breaker (10 amps) and multiply by 80 percent. You will arrive at a current of 8 amperes. This is approximate current drawn by the light. When light is switched on, there will be an increase of current from 10 to 18 amperes on ammeter. As each unit of electrical equipment is switched on, current will add up and the total, including battery, will read on ammeter.

Use the example of airplane's maximum continuous load with all equipment on is approximately 48 amperes for 60 ampere alternator. This approximate 48 ampere value, plus approximately two amperes for a fully charged battery, will appear continuously under these flight conditions. If the ammeter reading were to go much below this value, under the aforementioned conditions, trouble with the alternator system would be indicated and corrective action should be taken by switching off the least essential equipment. Locate faulty components as follows:

— CAUTION —

On air-conditioned aircraft, full alternator output on ground must be limited to not more than 10 minutes. Refer to Pilot's Operating Handbook.

a. Check airplane is positioned so prop blast will not interfere with other operations going on near by. Start engine and set throttle for 1000 to 1200 rpm.

b. Switch on the following loads and observe ammeter output increase as follows:

(1) Rotating beacon - 3 to 6 amps.
(2) Navigation and instrument lights (bright position) - 4 to 6 amps.
(3) Landing light - 7 to 9 amps.

If alternator does not meet above readings refer to troubleshooting chart. Follow troubleshooting procedure outlined on the chart. Check each cause and isolation procedure under a given trouble.

On airplanes without night-flying equipment, load required by test can be simulated by connecting a lamp-bank load consisting of 8 landing lights wired in parallel from main bus (+) to airframe ground (-), (refer to Figure 24-2) or 8, 3-ohm, 100-watt resistors.

3. Prestolite Alternator Service Procedures

The alternator and regulator are designed for use on only one polarity system. Observe the following when testing or servicing electrical system: (Failure to observe cautions will result in serious damage to electrical equipment.)

— CAUTION —

Disconnect battery before connecting or disconnecting test instruments (except voltmeter) or before removing or replacing any unit or wiring. Accidental grounding or shorting at regulator, alternator, ammeter, or accessories, will cause severe damage to units and/or wiring.

— CAUTION —

Alternator must not be operated on open circuit with rotor winding energized.

— CAUTION —

Do not attempt to polarize alternator. No polarization is required. Polarization will result in damage to alternator, regulator, or circuits.

— CAUTION —=

Grounding alternator output terminal will damage alternator and/or circuit and components.

— CAUTION —

Reversed battery connections will damage rectifiers, wiring, or other charging system components. Battery polarity must be checked with voltmeter before connecting battery. Most aircraft are negative ground.

— CAUTION —

If a booster battery or fast charger is used, polarity must be connected correctly to prevent damage to electrical system components.

4. Overhaul Of Prestolite Alternator

Complete alternator disassembly is not required for alternator repair. The complete overhaul is covered step-by-step to provide detailed information on each operation. In actual service practice, these operations may be used as required.

5. Disassembly Of Prestolite Alternator

a. Remove two number 10-24 screws holding brush holder assembly in slip ring end head. Remove brush and holder assembly from end head.
b. Remove safety wire from through bolts. Hold pulley with a strap wrench and remove pulley nut. Pulley must be removed with a puller. Remove fan, woodruff key, and spacer from shaft.
c. Remove four through bolts and tap drive end head lightly to separate drive end head and rotor, as a unit, from stator and slip ring end head.
d. Remove nuts, lock washers, flat washers, and insulators from output and auxiliary terminal studs. (Note carefully the correct assembly of insulator washers and bushings.) Using special tools shown in Figure 24-4, support end head and press out three negative rectifiers. End head can now be separated from stator assembly.
e. To remove slip ring end bearing and grease seal, have a hook type or impact type bearing puller as shown in Figure 24-3. (Do not remove bearing unless replacement is necessary.)

— NOTE —

The inner race of slip ring end bearing is pressed onto rotor shaft. When bearing replacement is necessary, replace complete bearing assembly, including inner race.

f. To remove drive end head from rotor shaft, use a puller that grips on bearing retainer plate as in Figure 24-5. Do not attempt to remove by supporting end head and pressing on shaft, as this may result in distortion of end head or stripping of retainer plate screws. Remove three retainer plate screws and press bearing out of end head. (Refer to Figure 24-6.)

6. Inspecting And Testing Components of Prestolite Alternator

Upon disassembly completion, all parts must be cleaned and visually inspected for cracks, wear, distortion, any signs of overheating, or mechanical interference.

a. Rotor: Rotor must be tested for gounded or shorted windings. Ground test is made with test probes, connected in series with a 110-volt test lamp, an ohmmeter, or any type of continuity tester. (Refer to Figure 24-7.) There must not be continuity between slip rings and rotor shaft or poles. To test for shorted turns in rotor winding, connect a voltmeter, ammeter, and rheostat as in Figure 24-8, or use an ohmmeter. Rotor current draw and resistance are listed in alternator service test specifications paragraph. Excessive current draw or a low ohmmeter reading indicates shorted windings. No current draw or an infinite ohmmeter reading indicate an open winding.
b. Rectifiers: A diode rectifier tester will detect and pinpoint open or shorted rectifiers without disconnecting stator leads. If a tester is not available, test probes and a no. 57 bulb, connected in series with a 12-volt battery can be used as follows:
   (1) Touch one test probe to a rectifier heat sink and the other test probe to a lead from one of the rectifiers in that heat sink.
   (2) Reverse position of the leads.

— NOTE —

Test bulb must light in one direction and not light in the other direction. If test bulb lights in both directions, one or more of the rectifiers in that heat sink is shorted.

   (3) To pinpoint defective rectifier, stator leads must be disconnected and above test repeated on each rectifier.

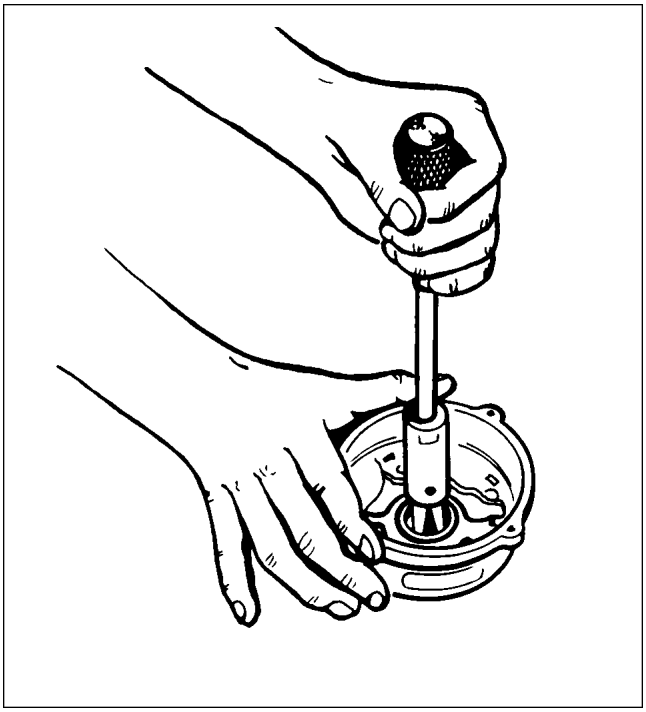


Figure 24-3. Removal of Slip Ring End Bearing
(Prestolite Alternator)

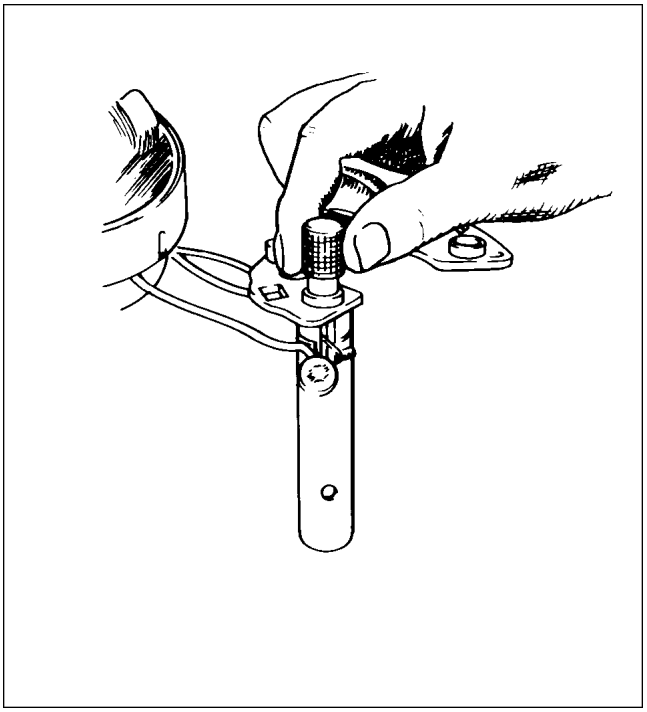


Figure 24-4. Removal of Rectifier
(Prestolite Alternator)

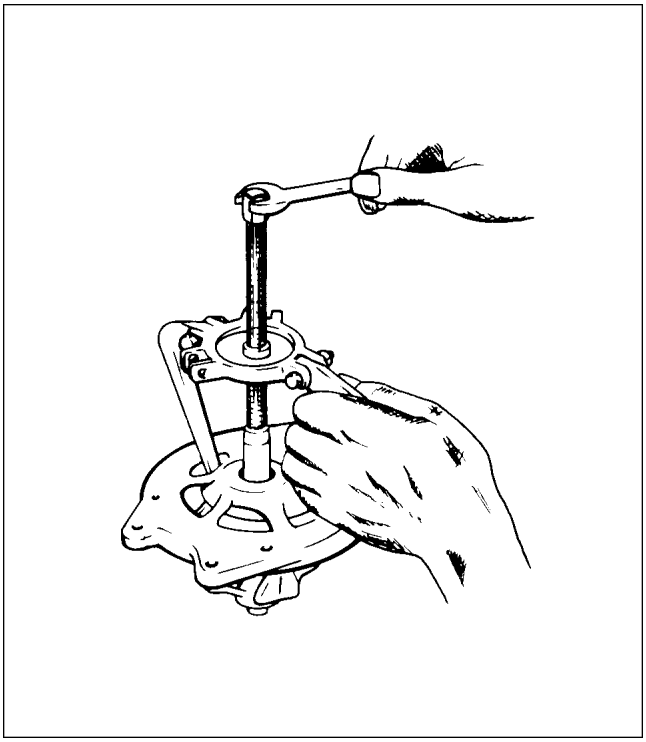


Figure 24-5. Removal of Drive End Head
(Prestolite Alternator)

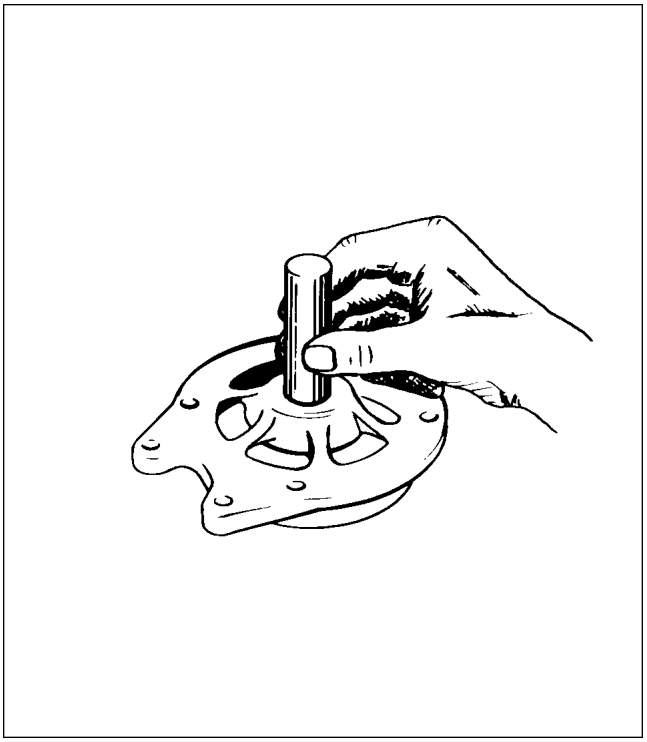


Figure 24-6. Removal of End Head Bearing
(Prestolite Alternator)

— NOTE —

Open rectifiers can only be detected, when using test bulb, by disconnecting stator leads. Test bulb will fail to light in either direction if rectifier is open.

c. Stator: The stator is tested for open or grounded windings with a 12-volt test bulb, described in rectifier section, or an ohmmeter, as follows:
   (1) Separate stator from slip ring end head just far enough to insert a fold of rags or block of wood (insulate stator from end head).
   (2) Test for grounded windings by touching one test bulb or ohmmeter probe to auxiliary terminal or any stator lead, and the other test bulb or ohmmeter probe to stator frame. (If test bulb lights, or ohmmeter indicates continuity, stator is grounded.)
   (3) Test for open windings by connecting one test probe to auxiliary terminal or stator winding center connection, and touch each of three stator leads. (Test bulb must light, or ohmmeter must show continuity.)

— NOTE —

Due to low resistance in stator windings, shorted windings are difficult to locate. Shorted stator windings will usually cause alternator to growl or be noisy during operation, and will show signs of overheating. If electrical checks are normal and alter - nator fails to supply its rated output, stator must be replaced to determine if it is the faulty component.

d. Bearings and seals: When alternator is overhauled, new bearings and oil or grease seals are recommended (even though bearings and seals may appear to be in good condition).

— NOTE —

A faulty seal will cause alternator to fail within a very short period of time.

7. Assembly Of Prestolite Alternator

a. Press ball bearing into drive end head using a flat block approximately two inch square, so pressure is exerted on outer race of bearing. Install retainer plate. With snap ring and retainer cup in place on rotor shaft, use a tool that fits over shaft and against inner bearing race, and press until inner bearing race is against snap ring retainer cup. (Refer to Figure 24-9.)

— CAUTION —

Use an arbor press, do not hammer. Reconnect stator leads to rectifiers. When soldering connections, use pliers as a heat dam on lead between solder joint and rectifier. Too much heat will damage rectifiers.

b. Carefully install rectifiers in slip ring end head or rectifier mounting plate by supporting unit and using special tools illustrated in Figure 24-10.

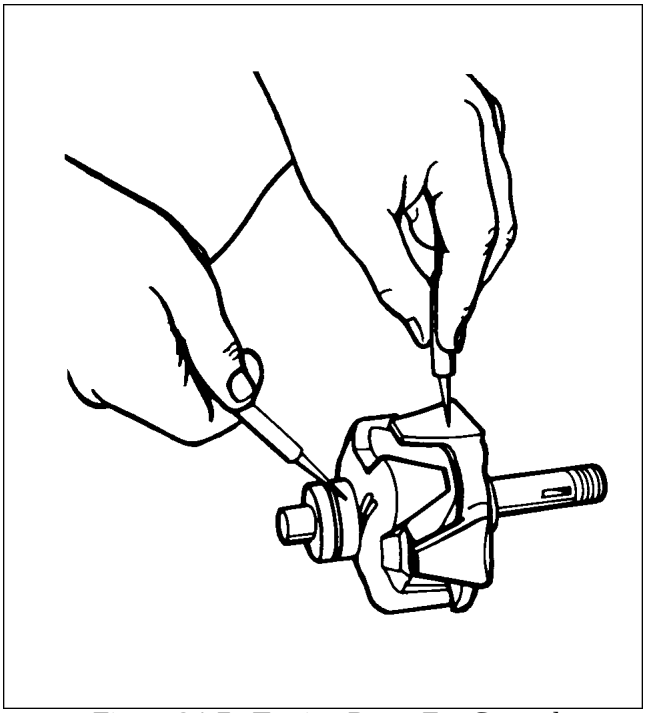


Figure 24-7. Testing Rotor For Ground
(Prestolite Alternator)

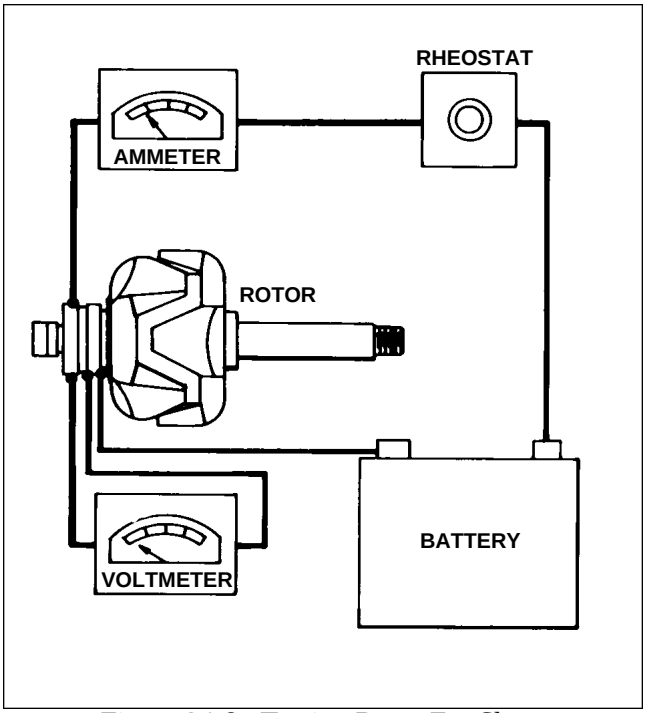


Figure 24-8. Testing Rotor For Shorts
(Prestolite Alternator)

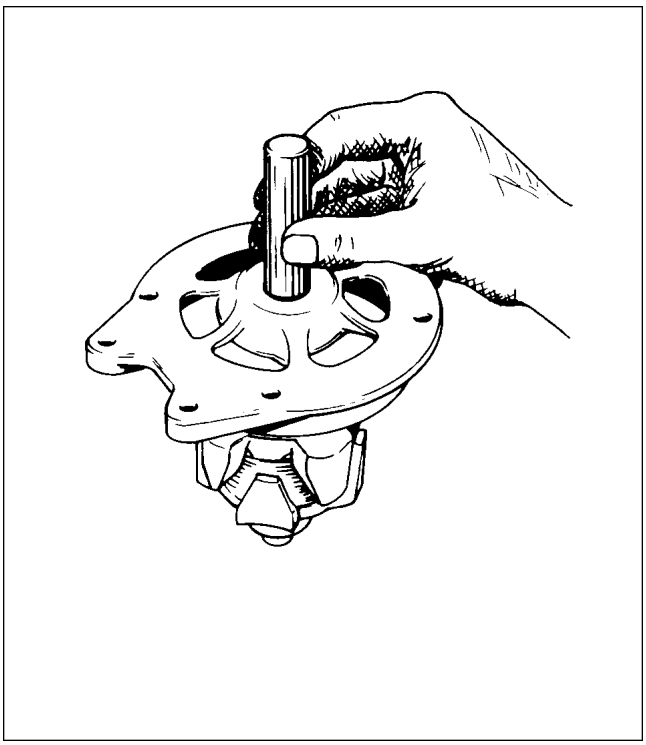


Figure 24-9. Installation of Beraring
(Prestolite Alternator)

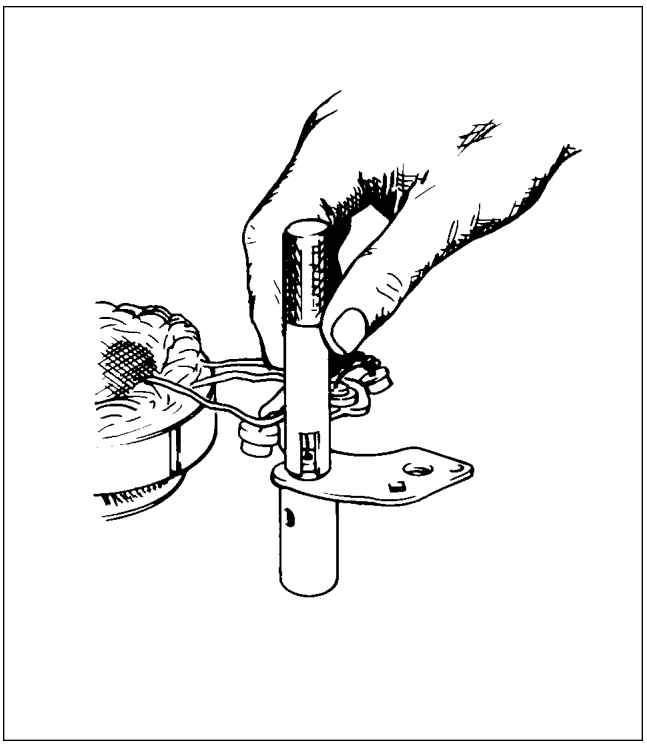


Figure 24-10. Installation of Rectifier
(Prestolite Alternator)

c. Assemble rectifier mounting plate studs and insulators. Verify they are in correct order. (Refer to Figure 24-11.)
d. After slip ring end head is completely assembled, stator and rectifier leads must be secured to rectifier mounting plate with epoxy. Verify stator leads are positioned so they do not interfere with rotor.
e. Install slip ring end bearing and oil seal. Verify oil seal lip is toward bearing. Stake oil seal in place. Assemble bearing, seal, inner race, and spacer as in Figure 24-12.
f. Assemble alternator and install the through bolts. Spin rotor to verify no mechanical interference. Tighten through bolts to torque of 30 to 35 inch-pounds. Safety wire must be installed after unit bench test for output. Install spacer, woodruff key, fan, pulley, lock washer, and nut. Tighten nut to torque of 35 foot-pounds. Use strap wrench to hold pulley.
g. Install brush and holder assembly and retaining screws. Spin rotor and check for interference between brush holder and rotor. Check between field terminal and ground with ohmmeter. Ohmmeter will read rotor resistance. (Refer to Chart 2403, Alternator Specifications.)

8. Testing Prestolite Alternator

a. Wiring connections for bench testing alternator are in Figure 24-13. Refer to Chart 2403 for output test figures. Adjust carbon pile to obtain specified voltage.
b. After bench testing alternator, install safety wire and install alternator.

9. Prestolite Alternator Service Tips

a. Bearings: These units have a sealed ball bearing at drive end and a two-piece roller bearing at slip ring end. The inner race is pressed onto rotor shaft and the rest of the bearing is in slip ring end head. When unit is assembled, inner race aligns with bearing. When bearing is replaced, new inner race must be installed on rotor shaft.
b. Lubrication: Slip ring end bearing must be lubricated when alternator is disassembled. Bearing should be thoroughly cleaned and repacked with Shell Alvania no. 2 or equivalent bearing lubricant. Cavity behind bearing must be packed one-third to one-half full with the same lubricant.
c. Brushes: These units have a separate brush holder assembly installed after alternator assembly. Brush holder has a small hole that intersects the brush cavities. Use a pin or wire, as in figure 24-14 to hold brushes in holder during assembly. Remove pin after brush holder retaining screws are tightened. Check brushes are seated against slip rings.
d. Drive Pulley: Tighten drive pulley retaining nut to a torque of 35 foot-pounds.

THIS SPACE INTENTIONALLY LEFT BLANK

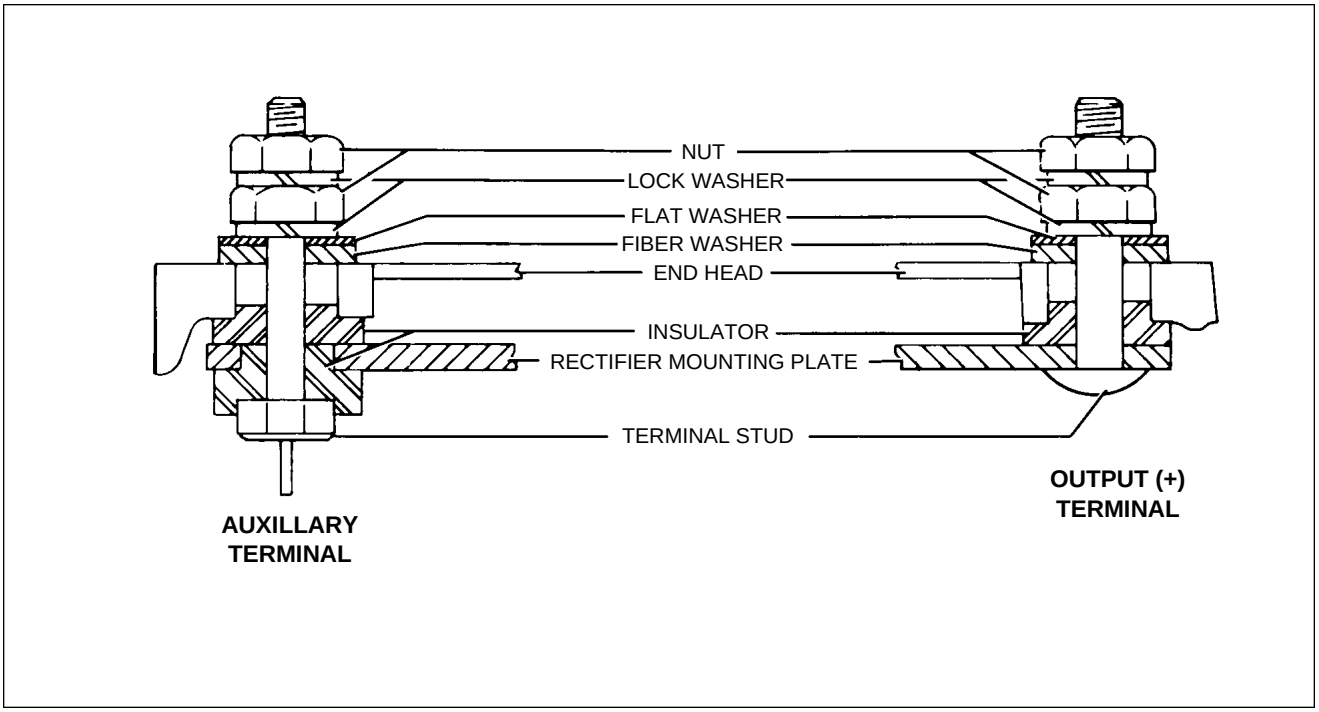


Figure 24-11. Terminal Assembly
(Prestolite Alternator)

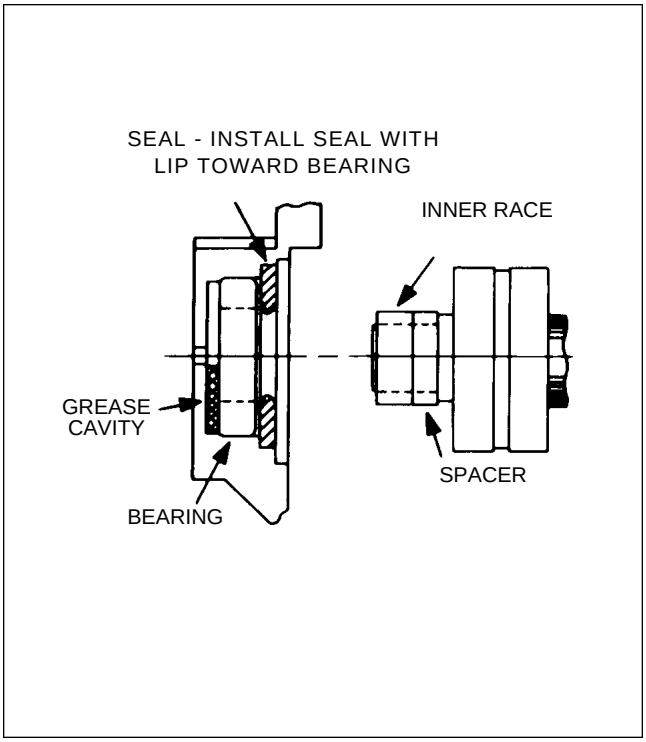


Figure 24-12. Slip Ring End Bearing Assembly
(Prestolite Alternator)

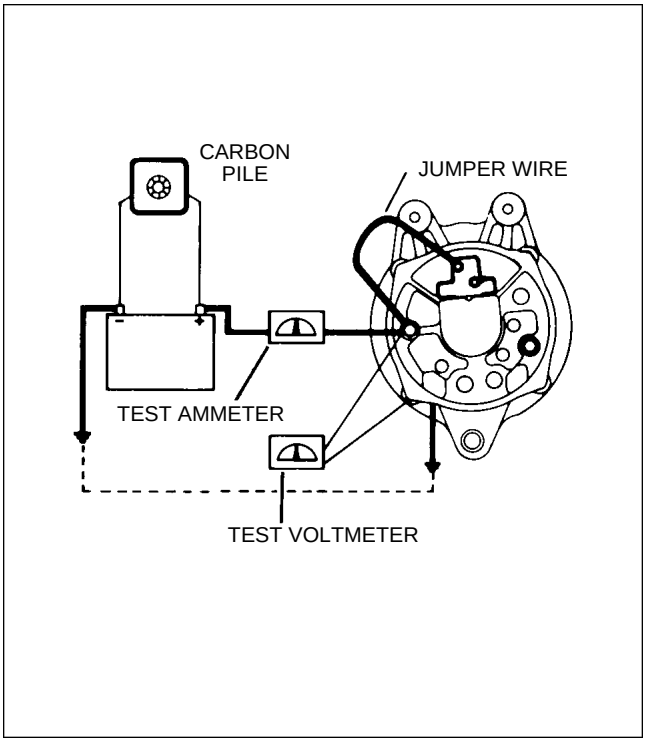


Figure 24-13. Testing Prestolite Alternator

10. Prestolite Alternator Service Test Specifications

CHART 2403. PRESTOLITE ALTERNATOR SPECIFICATIONS

ALTERNATOR MODEL	PRESTOLITE ALY 6422 (1)	
Voltage	12-volts	
Rated Output	60 amperes	
Ground Polarity	Negative	
Rotation	Bi-Directional	
Rotor:		
Current Draw	2.4 to 4.0 amps @ 12.0-volts (70°F - 80°F)	
Resistance	3.5 - 5.0 ohms (70°F - 80°F)	
Output Test (77° F):		
Volts	14.0	14.0
Amperes Output	13.0	47.0
Alternator rpm	2000 min	4000 min
(1) Air conditioned aircraft		

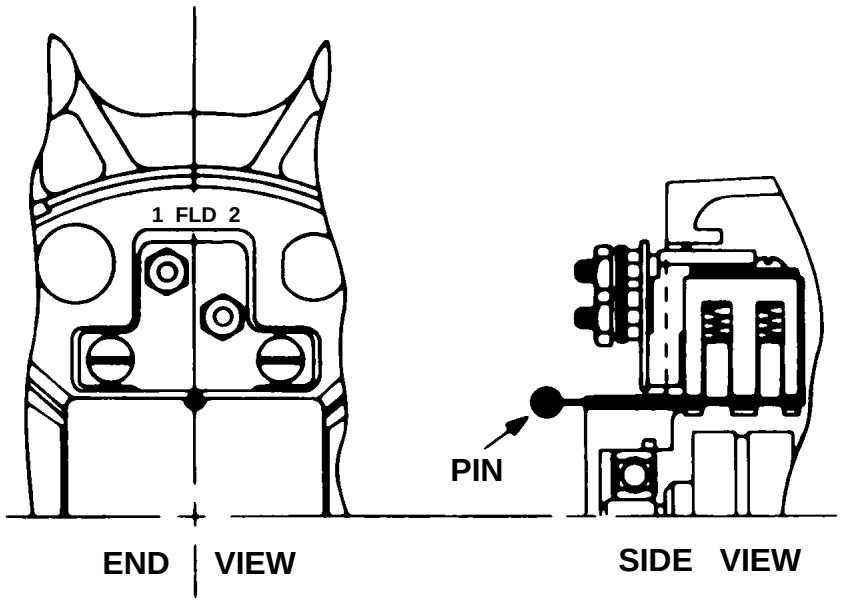


Figure 24-14. Prestolite Alternator Brush Installation

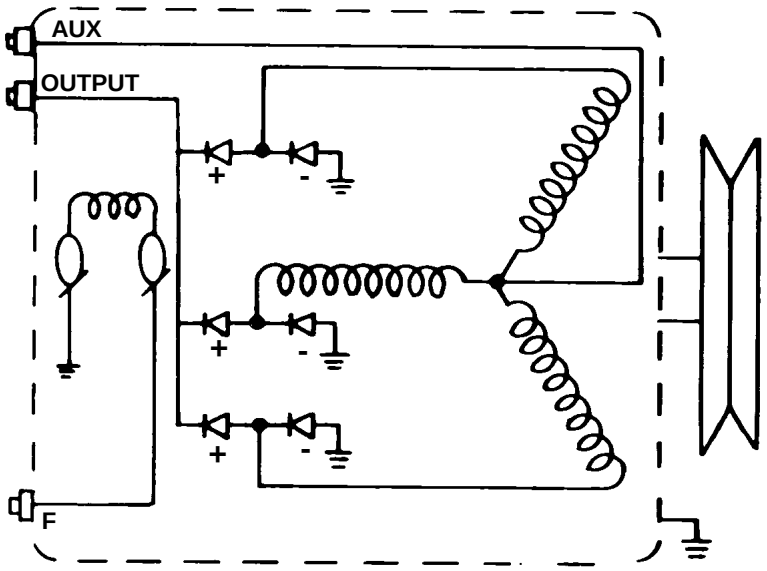


Figure 24-15. Prestolite Alternator Internal Wiring Diagram

B. CHRYSLER 14 VDC, 60 AMP ALTERNATOR SYSTEM (ARCHER II)

1. Description Of Chrysler Alternator System

The alternator is on front lower right side of engine without air conditioning, and front lower left side with air conditioning. It uses a belt drive from the engine crankshaft. Full electrical power output is available regardless of engine rpm.

The alternator has no armature or commutator and only a small pair of carbon brushes, that contact a pair of copper slip rings. The rotating part of alternator, known as the rotor, is actually the field windings. The rotor draws only 1/20th of the current output. There is very little friction, negligible wear, and heat in this area. Alternating current is converted to direct current by diodes. The diodes are reliable solid-state devices, but easily damaged if current flow is reversed through them.

The alternator system does not require a reverse current relay, due to high back resistance of the diodes and inability of the alternator to draw current or motorize. A current regulator is unnecessary because the windings are designed to limit maximum current available. The voltage regulator is the only control needed.

An additional latching circuit keeps the master solenoid closed when battery voltage is low and the engine starter is being operated. This circuit transfers voltage from the alternator to the master solenoid coil, holding the master solenoid in the closed position and allowing the starter to function. This circuit will also supply voltage to the battery. A diode is placed into this circuit to prevent reverse current flow from the battery to the alternator.

The circuit breaker panel contains a 5 ampere circuit breaker marked ALT FIELD. If the field circuit breaker trips, a complete shutdown of power from the generating system will result. After a one or two minute cool-down, the breaker can be set manually. If tripping occurs and resetting the breaker will not prevent continual tripping, a short exists in the alternator field.

The ammeter does not indicate battery discharge. It displays the load in amperes placed on the generating system. With all electrical equipment off, except the master switch, the ammeter will read the charging current demanded by the battery. The amount will vary, depending on percentage of charge in the battery. As the battery charges, the amount of current displayed on the ammeter will reduce to approximately two amperes. The amount of current displayed on the ammeter will show if the alternator system is operating normally.

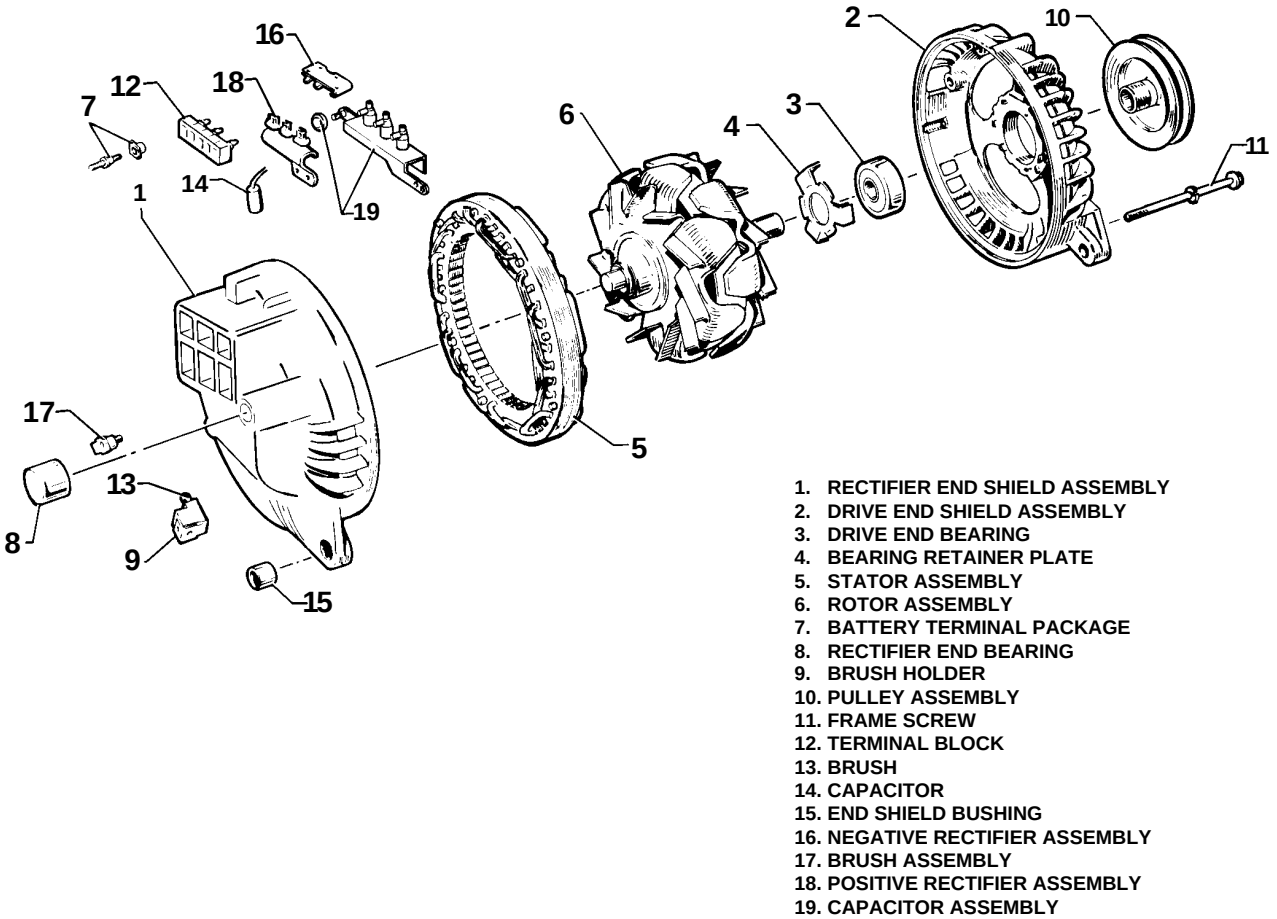


Figure 24-16. Exploded View of Chrysler Altenator

2. Checking Chrysler Alternator System

With all electrical equipment off (except master switch) ammeter will read charging current demanded by battery. The amount will vary, depending on the percentage of charge in battery. As battery charges, current reading on ammeter will reduce to approximately two amperes. Ammeter current reading will show immediately whether or not alternator system is operating normally.

— NOTE —

Current shown on ammeter is the load in amperes demanded by electrical system from alternator. As a check take, for example, a condition where battery is demanding 10 amperes charging current; then switch on landing light. Note value in amperes placarded on circuit breaker panel for landing light circuit breaker (10 amps) and multiply by 80 percent. Current will be 8 amperes. This is the approximate current drawn by the light. When light is switched on, an increase of current from 10 to 18 amperes reads on ammeter. As each unit of elec - trical equipment is switched on, current will add up. The total, including battery, will read on ammeter.

Use the example that the airplane's maximum continuous load with all equipment on is approximately 48 amperes for 60 ampere alternator. The approximate 48 ampere value, plus approximately two amperes for fully charged battery, will appear continuously under these flight conditions. If ammeter reading is below this value, trouble with alternator system will be indicated and corrective action must be taken by switching off the least essential equipment.

Locate faulty components as follows:

— CAUTION —

On air conditioned aircraft, full alternator output on ground must be limited to not more than 10 minutes. Refer to Pilot's Operating Handbook.

a. Check airplane is positioned so prop blast will not interfere with other near by operations. Start engine and set throttle for 1000 to 1200 rpm.
b. Switch on following loads and observe ammeter output increase as follows:
   (1) Rotating beacon - 3 to 6 amps.
   (2) Navigation and instrument lights (bright position) - 4 to 6 amps.
   (3) Landing light - 7 to 9 amps.

If alternator does not meet above indications, refer to troubleshooting chart. Follow troubleshooting procedure outlined on chart. Check each cause and isolation procedure under a given trouble.

On airplanes without night-flying equipment, load required by test can be simulated by connecting a lamp-bank load consisting of 8 landing lights wired in parallel from main bus (+) to airframe ground (-), (refer to figure 24-1) or 3 ohm, 100 watt resistors.

3. Overhaul Of Chrysler Alternator

When repairing alternator, complete disassembly may not be required. In some cases it will only be necessary to perform operations required for repair.

4. Chrysler Alternator Rotor Field Coil Current Draw (Refer to figure 24-17.)

a. Connect jumper wire between one field terminal of alternator and positive terminal of fully charged battery.

b. Connect test ammeter positive lead to the other alternator field terminal. Connect test ammeter negative lead to battery negative terminal.

— CAUTION —

A low rotor coil draw indicates high resistance in the field coil circuit (brushes, slip rings or rotor coils). A higher rotor coil draw indicates possible shorted rotor coil or grounded rotor.

c. Watch the ammeter, slowly rotate alternator rotor by hand.
   (1) Field coil draw must be 4.5 to 6.5 amperes at 12-volts.
   (2) No reading indicates an open rotor or defective brushes.

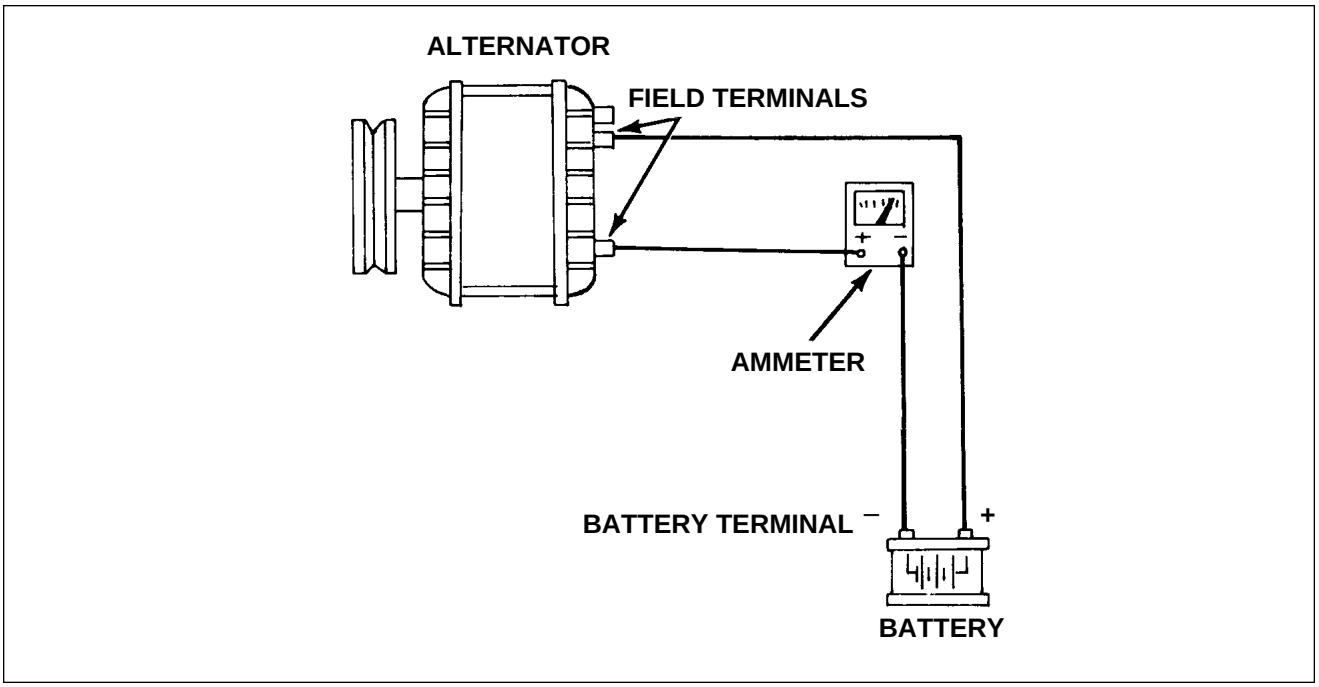


Figure 24-17. Checking Chrysler Alternator Field Current Draw

5. Testing Chrysler Alternator Internal Field Circuit

— CAUTION —

The stack of parts attaching insulated brush holder assembly to end shield must be installed in the following sequence: Insulated brush holder, field terminal, insulating washer, lock washer, and attaching screw.

Test alternator internal field circuit for short circuit to ground, as follows:

a. Remove ground brush and place one test probe of 110-volt test lamp to field terminal. Attach remaining test probe to machined surface at one of the alternator end shields. Test lamp should not light. (Refer to Figure 24-18.)
b. If test lamp lights, proceed as follows:
   (1) Remove insulated brush assembly.
   (2) Remove three through bolts and separate the two end shield assemblies.
   (3) Touch one test lamp probe to one slip ring and remaining test probe to rotor shaft. Lamp should not light. Lighted test lamp indicates a grounded rotor assembly and re- quires rotor replacement. If test lamp does not light, a ground condition exists in insulated brush assembly. (Brush assembly has either been improperly assembled or was damaged and has short circuited through to ground.) Inspect brush holder and insulated washer. Replace if damaged.

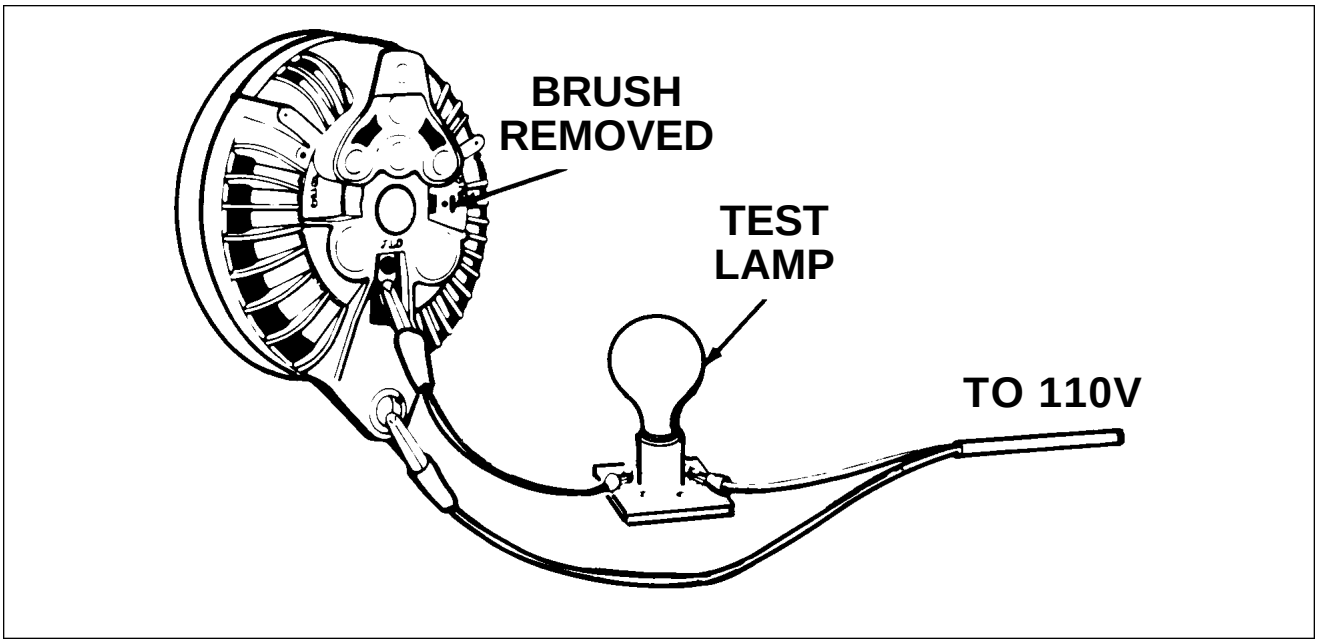


Figure 24-18. Testing Chrysler Alternator Field Current

6. Inspection Of Chrysler Alternator

a. Inspect condition of alternator components and slip rings. Check for burning, wear, or oil.
b. Inspect brushes for signs of sticking in holder or shield and for wear.
c. Inspect bearing surface of rotor shaft and roller bearings at rectifier end.
   (1) Rotate rotor in drive end shield to feel for roughness in bearing.
   (2) Inspect grease retainer.
   (3) Inspect rectifier leads at connections for good solder joint and condition of insulation.
   (4) Verify rectifier/stator lead is pushed down into slots cast in end shield and cemented with MoPar cement No. 2299314. (Refer to Figure 24-19)

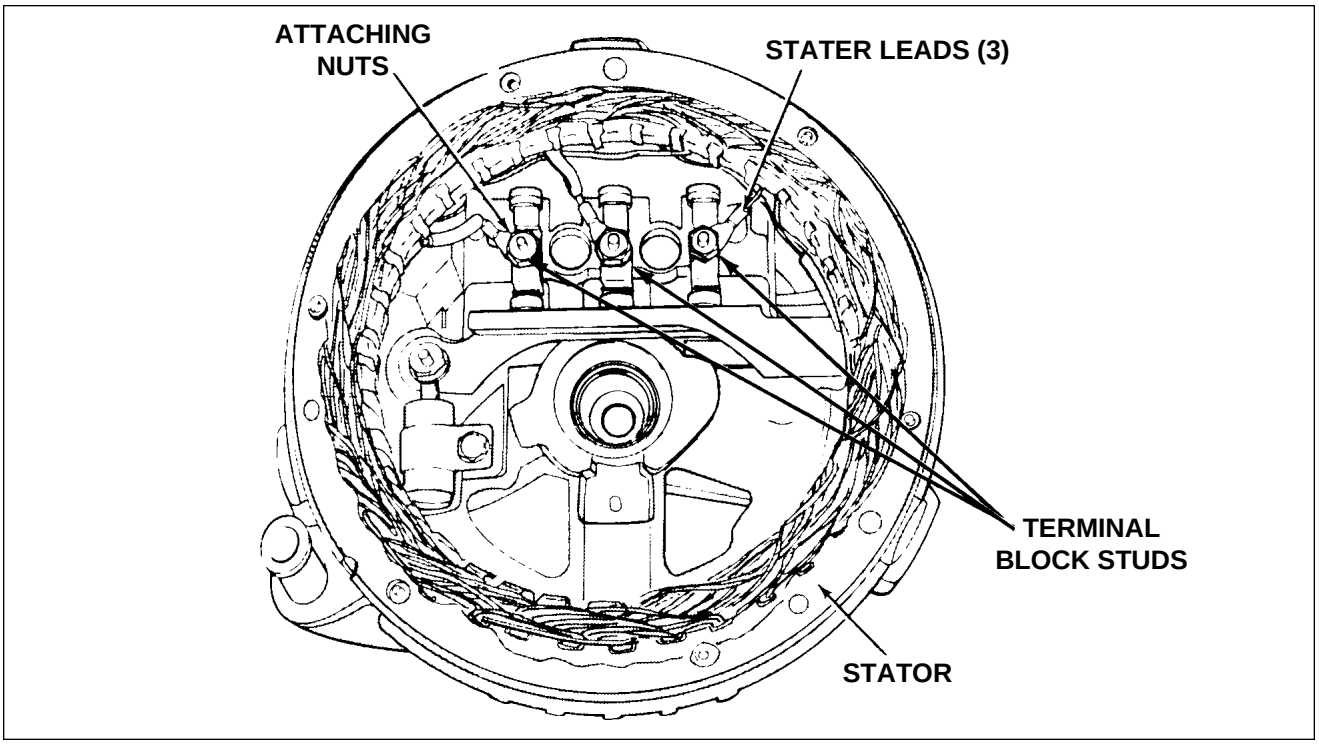


Figure 24-19. Chrysler Alternator Rectifier End Shield and Stator Assembly

7. Testing Rectifier Assemblies Of Chrysler Alternator

— CAUTION —

Plastic cases surrounding rectifiers are for protection against corrosion and must not be broken. When performing tests, always touch test probe to metal strap nearest rectifier.

The two methods of testing rectifiers are the test lamp method and a method utilizing a special Rectifier Tester Tool no. C-3829. The Rectifier Tester Tool method is preferred. It gives quick, simple, and accurate test of alternator rectifiers without disconnecting stator phase leads (Figure 24-19). Both methods are described in this chapter.

a. Testing Of *Positive* Rectifiers Using C-3829 Tester (Refer to figure 24-20.)

(1) Place rectifier end shield and stator assembly on an insulated surface.
(2) Plug tester C-3829 power source lead into 110-volt ac power supply.
(3) Connect test lead alligator clip of tester C-3829 to alternator output terminal.
(4) Touch metal strap of each positive rectifier to test probe.
  (a) A reading of 1.75 amps or more is a satisfactory rectifier. Readings and direction of needle movement must be the same for all three rectifiers.
  (b) When two rectifiers are good and one is shorted, reading taken at the good rectifiers will be low and reading at shorted rectifier will be zero. Disconnect lead to rectifier reading zero and test. With the defective rectifier disconnected, the reading of good rectifiers will be a satisfactory range.
  (c) When one rectifier is open, tester will read approximately one amp while the two good rectifiers will read within the satisfactory range.

b. Testing Of *Negative* Rectifiers Using C-3829 Tester (Refer to figure 24-21.)

(1) Connect test lead alligator clip to rectifier end housing.
(2) Touch metal strap of each negative rectifiers to test probe and note each reading.
(3) Test indications for negative rectifiers are the same for positive rectifiers except test meter will read on the opposite side of scale.

— NOTE —

If negative rectifier shows shorted, isolate stator from rectifier end shield and retest. Stator winding could be grounded to sta - tor laminations or rectifier end shield which would indicate a shorted negative rectifier.

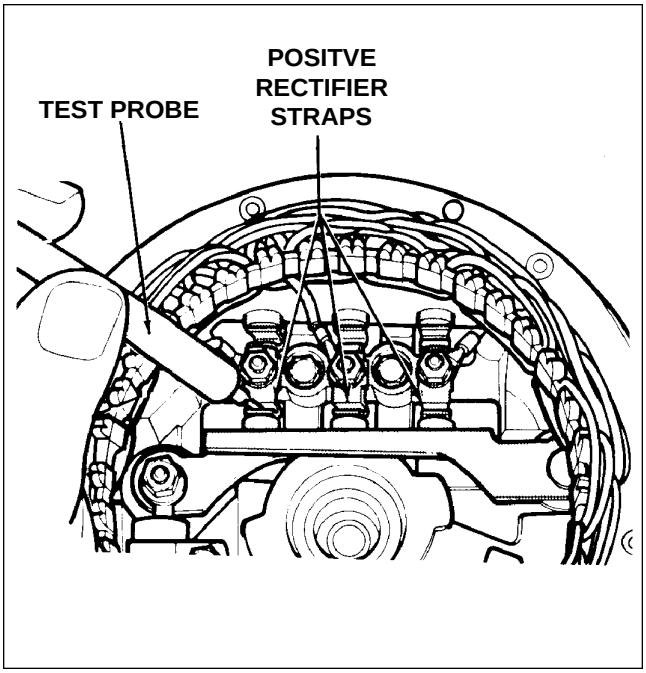


Figure 24-20. Testing Chrysler Alternators *Positive* Rectifiers With C-3829 Tester

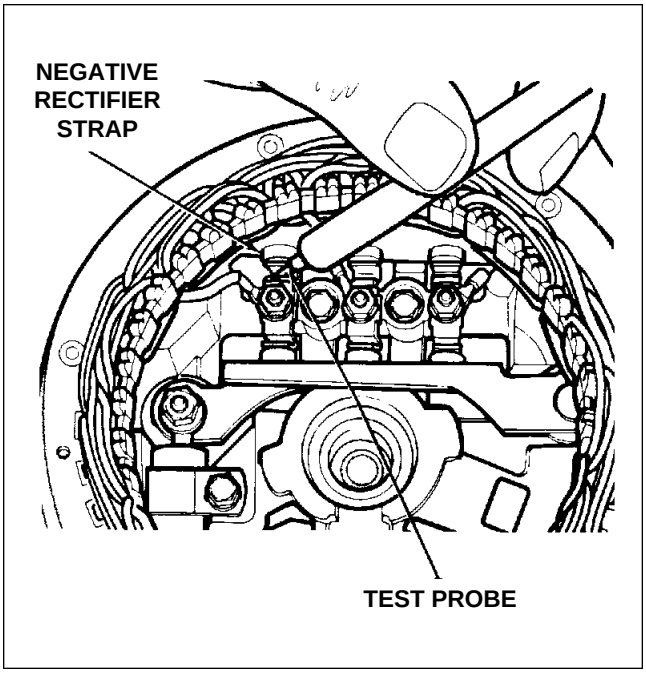


Figure 24-21. Testing Chrysler Alternators *Negative* Rectifier C-3829 Tester

c. Testing Of Rectifier Assemblies Using Test Lamp (Refer to Figures 24-22 and 24-23.)

(1) Remove nuts from terminal block studs holding stator windings and positive and negative rectifier straps.
(2) Lift off stator winding terminals and carefully pry stator assembly from end shield.
(3) Test rectifiers with 12-volt battery and a test lamp equipped with a no. 67 bulb.
  (a) Connect one side of test lamp to positive battery post and the other side of lamp to test probe.
  (b) Connect another test probe to the negative battery post.
(4) Place one test probe on rectifier heat sink and the other test probe on strap on top of rectifier. Note whether or not test lamp lights. Repeat test for each rectifier.

(5) Reverse test probes (move probe from rectifier heatsink to rectifier strap and move probe from rectifier strap to rectifier heatsink), and repeat test for each rectifier.

— NOTE —

If test lamp lights in one direction but not in the other, rectifier is satisfactory. If the test lamp lights in both directions, the rectifier is shorted. If test lamp fails to light in either direction, rectifier is open.

— NOTE —

Lamp must light in the same direction for all rectifiers on each assembly.

— NOTE —

Replace rectifier and heatsink assemblies which have shorted or open rectifiers.

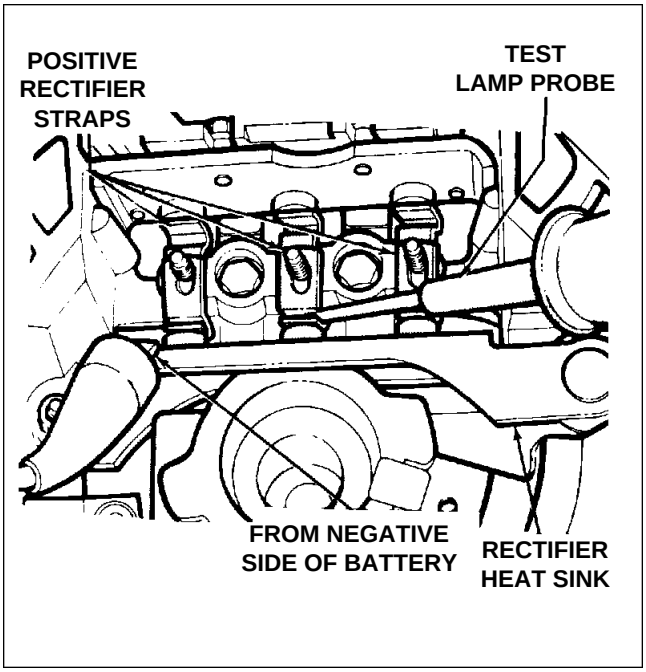


Figure 24-22. Testing Chrysler Alternators
Positive RectifiersWith Test Lamp

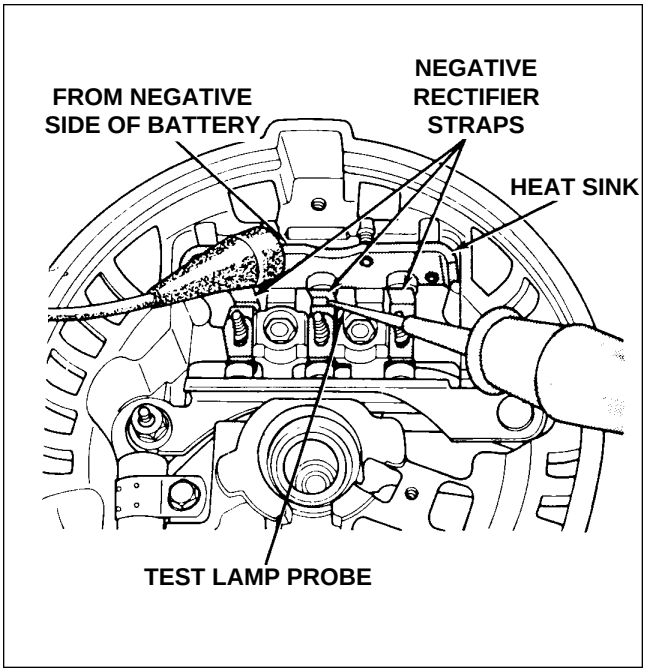


Figure 24-23. Testing Chrysler Alternators
Negative Rectifiers With Test Lamp

8. Removal Of Chrysler Alternator Rectifier And Heatsink Assembly (Refer to figure 24-24.)

a. Remove four screws holding negative rectifier and heatsink assembly to rectifier end shield.
b. Remove nut and washer from output terminal, and remove round plastic insulator.
c. Turn rectifier end shield over, and remove nut and washer from end shield stud.
d. Remove capacitor attaching screw, and lift out capacitor, insulated washer, and heatsink assembly. Remove round plastic insulator from output terminal hole.
e. Remove mica insulator from end shield stud.

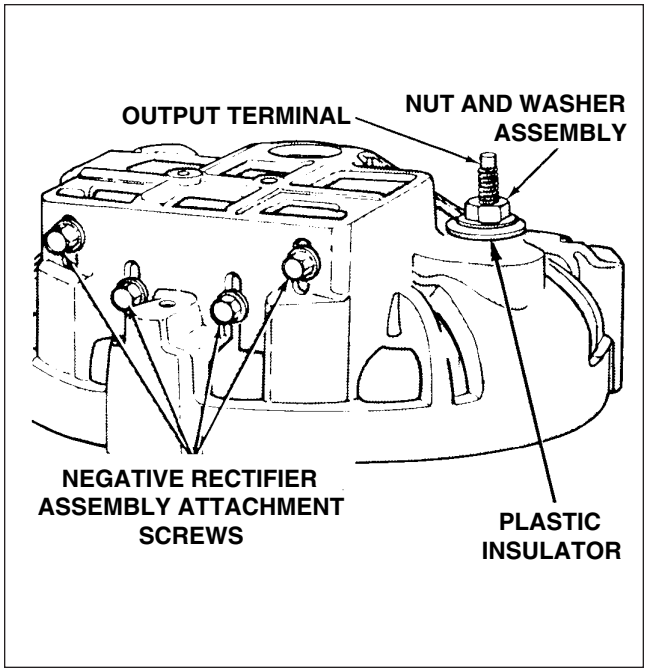


Figure 24-24. Chrysler Alternators Rectifier and Heatsink Assembly Removal

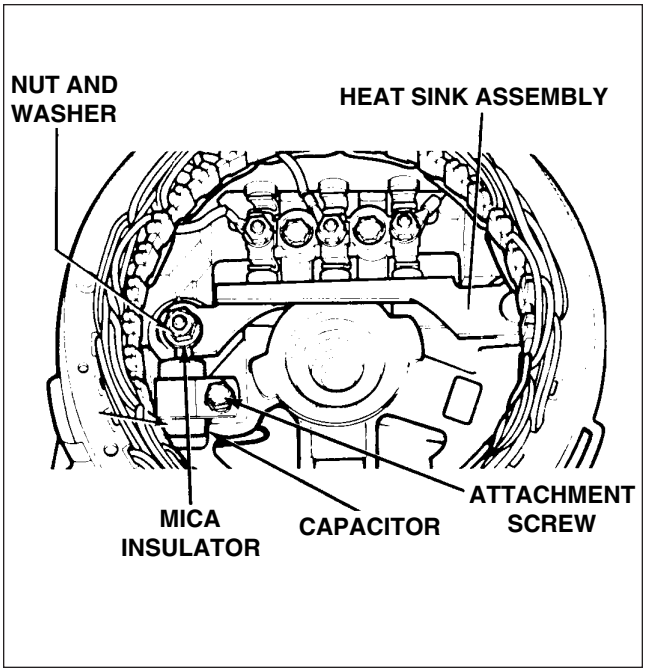


Figure 24-25. Chrysler Alternators Rectifier End Assembly

9. Testing Of Chrysler Alternator Stator (Refer to Figure 24-26.)

a. Remove varnish from a spot on stator frame.
b. Press test probe firmly onto bare spot.
c. Press other test probe firmly to each of three stator lead terminals one at a time. If lamp lights individual stator lead is grounded.
d. Press one of the test probes firmly on one stator lead and press the other test probe firmly onto each of the other two stator leads one at a time. Test lamp must light. If lamp does not light stator winding is open.
e. If stator is grounded or open, replace stator.

10. Removal Of Chrysler Alternator Pulley And Bearing

— CAUTION —

Pulley and bearing are installed on rotor shaft with an interference fit.Use Puller Tool C-4068 to reduce possibility of damage to pulley or bearing.

a. Remove pulley with tool C-4068. (Refer to Figure 24-27.)
b. Remove three bearing retainer screws.
c. Pry drive end bearing retainer from end shield with screwdriver.
d. Support end shield and tap rotor shaft with plastic hammer to separate rotor from end shield.
e. Remove drive end ball bearing with Puller Tool C-4068. (Refer to figure 24-28.)
f. Needle bearing in rectifier end shield is a press fit. If necessary to remove rectifier end shield needle bearing, protect end shield by supporting shield with tool C-3925 when pressing the bearing out with tool C-3770A. (Refer to figure 24-29.)

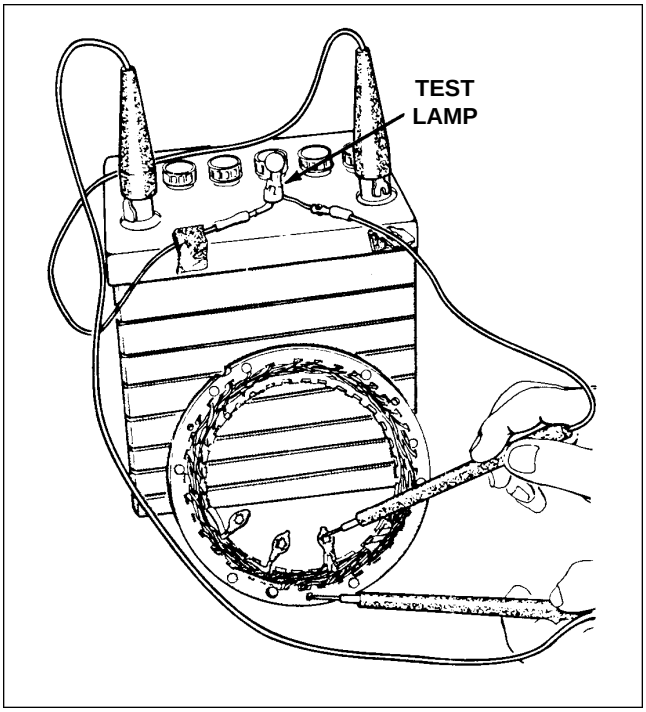


Figure 24-26. Testing Chrysler Alternator Stator

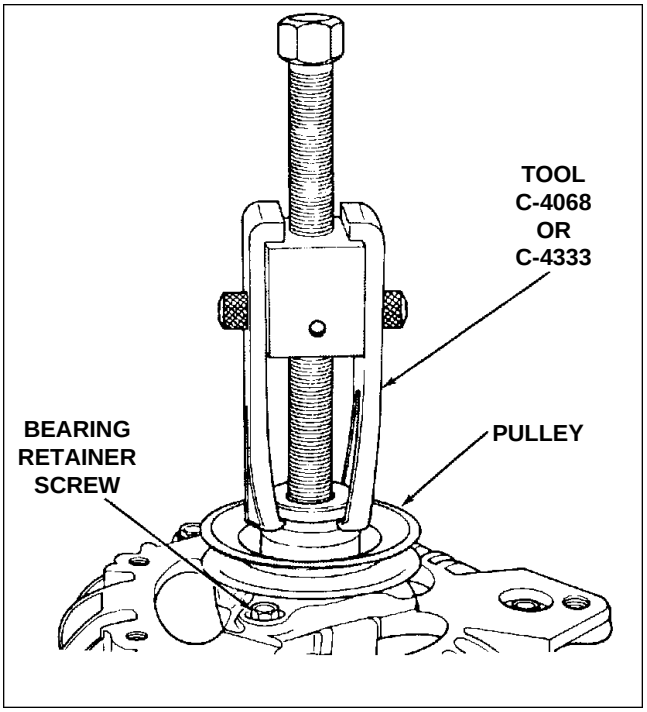


Figure 24-27. Removal of Chrysler Alternator Pulley

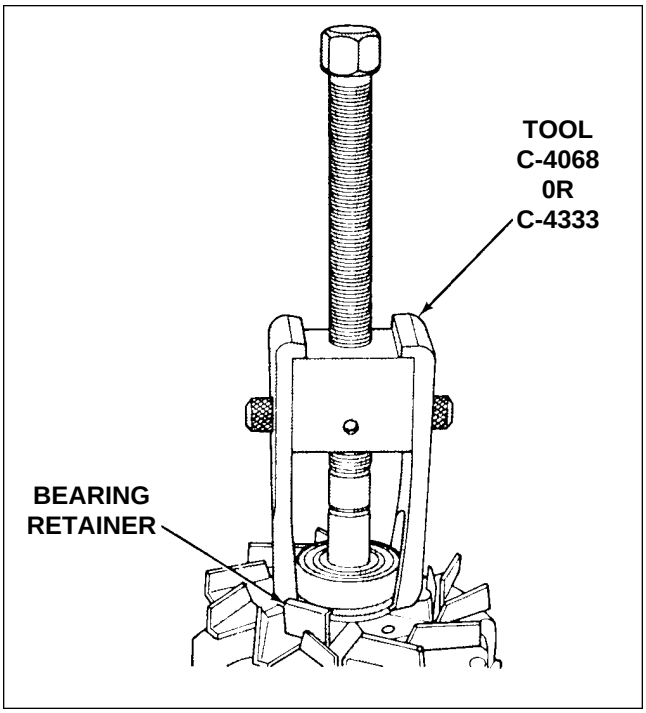


Figure 24-28. Removal of Chrysler Alternator Bearing

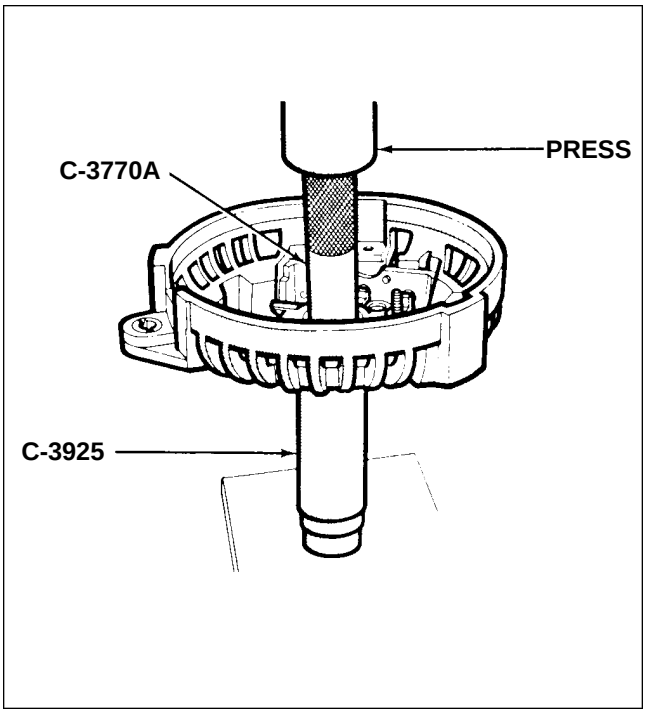


Figure 24-29. Removal of Chrysler Alternator Rectifier End Shield Bearing

11. Testing Of Chrysler Alternator Rotor (Refer to Figures 24-30 and 24-31.)

a. Check for a grounded field coil by connecting an ohmmeter from each slip ring to rotor shaft. Ohmmeter should read infinite. Rotor is grounded if reading is zero or higher.

b. To check for an open field coil, connect ohmmeter to slip rings.
   (1) Ohmmeter must read between 1.5 and 2.0 ohms on rotor coils at room ambient conditions.
   (2) Ohmmeter must read between 2.5 and 3.0 ohms on rotor coils that have been operated on aircraft at higher engine compartment temperatures.
   (3) Readings above 3.5 ohms indicate high resistance rotor coils and further testing or replacement is required.

c. To check for a shorted field coil, connect ohmmeter to the two slip rings. Reading below 1.5 ohms, indicates field coil is shorted.

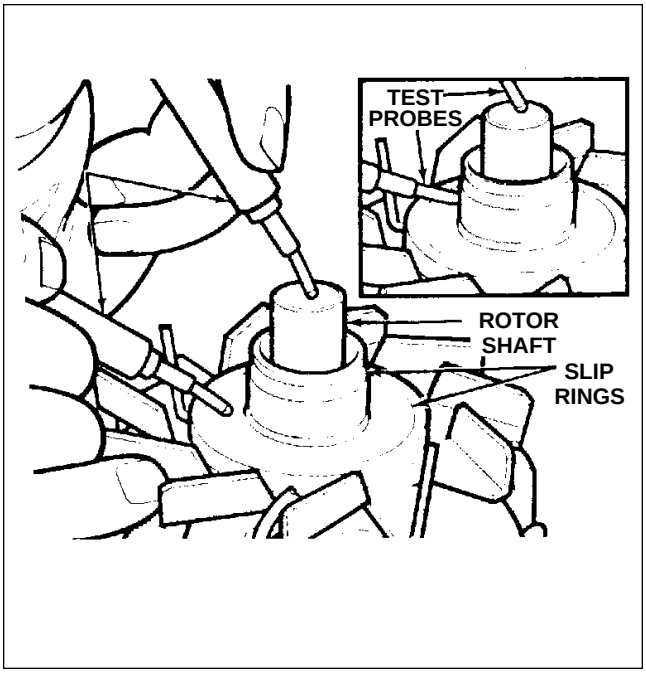


Figure 24-30. Testing Chrysler Alternator Rotor for Ground

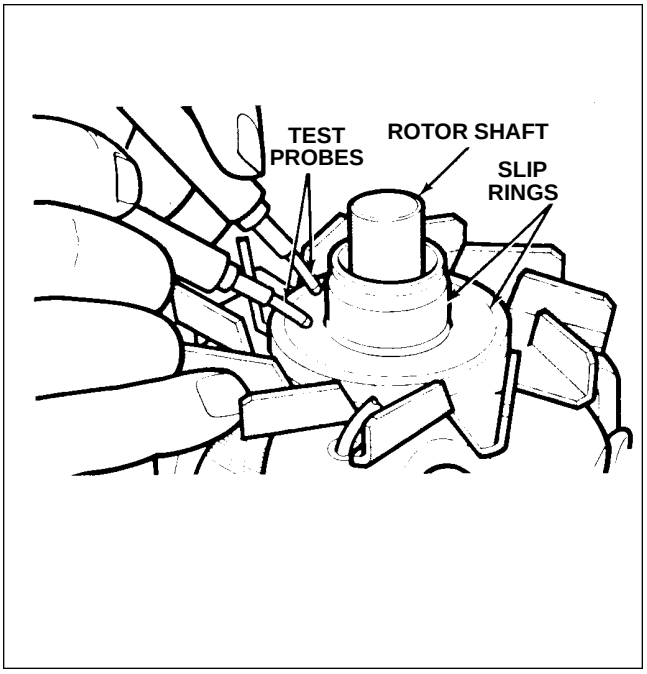


Figure 24-31. Testing Chrysler Alternator Rotor for Opens or Shorts

12. Chrysler Alternator Slip Rings

Slip rings are part of rotor assembly and are not serviced separately.

13. Assembly Of Chrysler Alternator

a. Position grease retainer on rotor shaft and press retainer on shaft with installer tool C-3921. Plastic retainer is properly positioned when inner bore of installer tool bottoms on rotor shaft. (Refer to Figure 24-32.)

b. Position rectifier end shield bearing on base of tool C-4201. Place alternator end shield atop bearing and properly align. With top part of tool C-4201 on end shield, press into place until it bottoms against it. (Refer to Figure 24-33.)

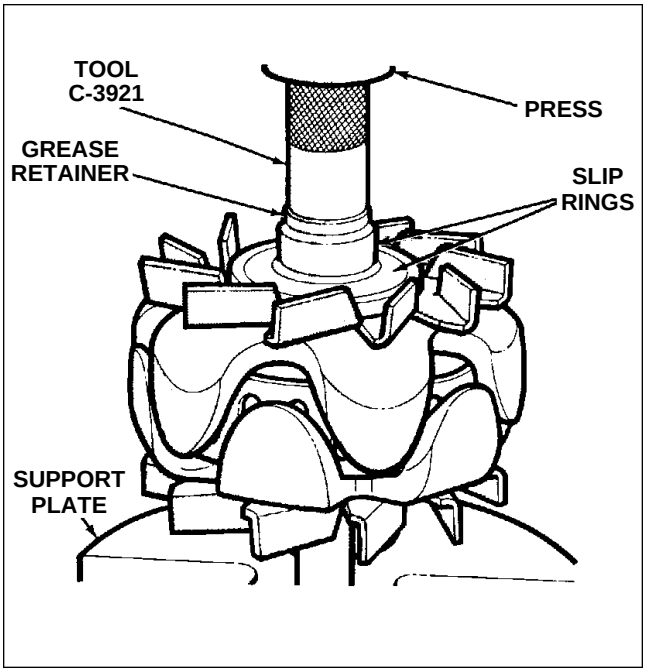


Figure 24-32. Installation of Chrysler Alternator Grease Retainer

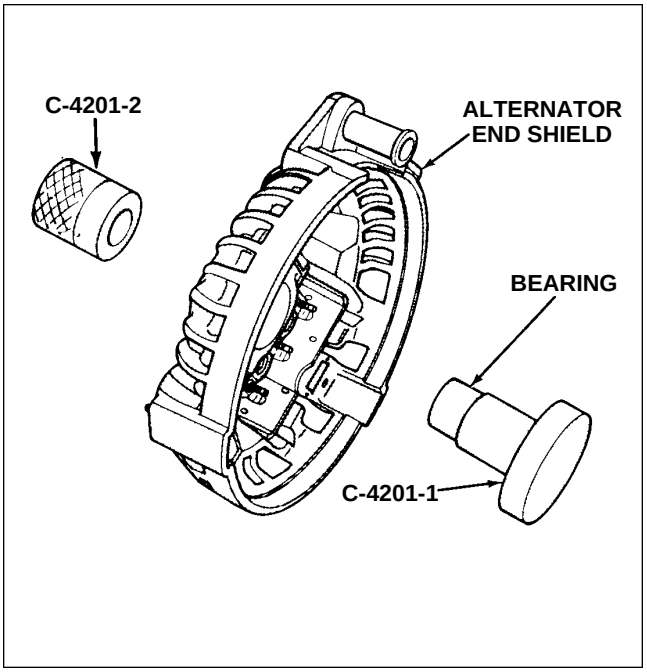


Figure 24-33. Installation of Chrysler Alternator Rectifier End Shield Bearing

— NOTE —

New bearings are pre-lubricated. No Additional lubrication is required.

c. Insert drive end bearing in drive end shield and install bearing retainer plate to hold bearing in place. Install all three bearing retainer screws. Tighten to torque of 25 to 45 inch-pounds.

— CAUTION —

Verify bearing is installed squarely at installation or damaged bearing will result. Press bearing on rotor shaft until bearing contacts shoulder on rotor shaft fan hub.

d. Position bearing and drive end shield on rotor shaft, hold rotor shaft base, and press bearing end shield into position on rotor shaft with an arbor press and tool C-3858. (Refer to Figure 24-34.)

— CAUTION —

Press pulley onto rotor shaft until pulley contacts inner race of drive end bearing. Do not exceed 6800 pounds pressure. Do not hammer.

e. Install pulley on rotor shaft. Rotor shaft must be supported so all pressing force is on pulley hub and rotor shaft. (Refer to Figure 24-35.)
f. Install mica insulator on heatsink mounting stud in the end shield.
g. Install round plastic insulator, flat face up, in battery stud hole in the end shield. (Refer to Figure 24-36.)

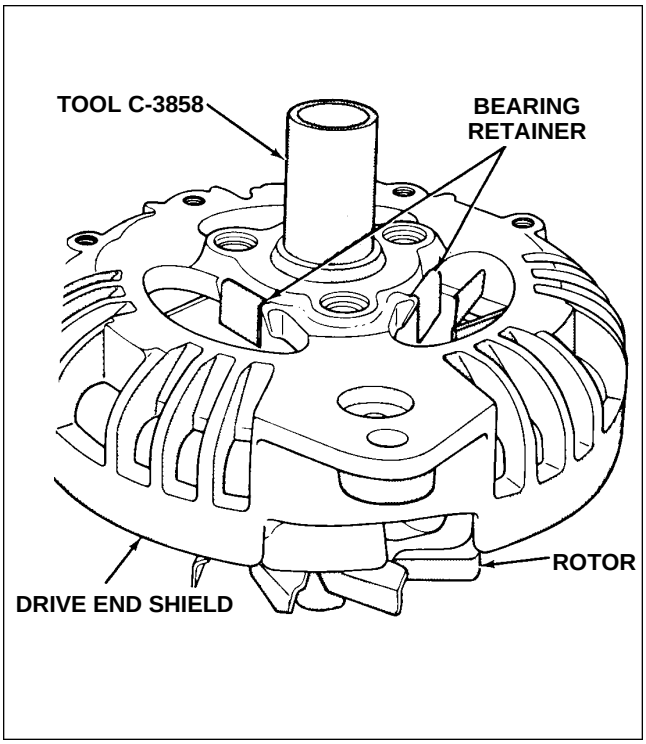


Figure 24-34. Installation of Chrysler Alternator Drive End Shield Bearing

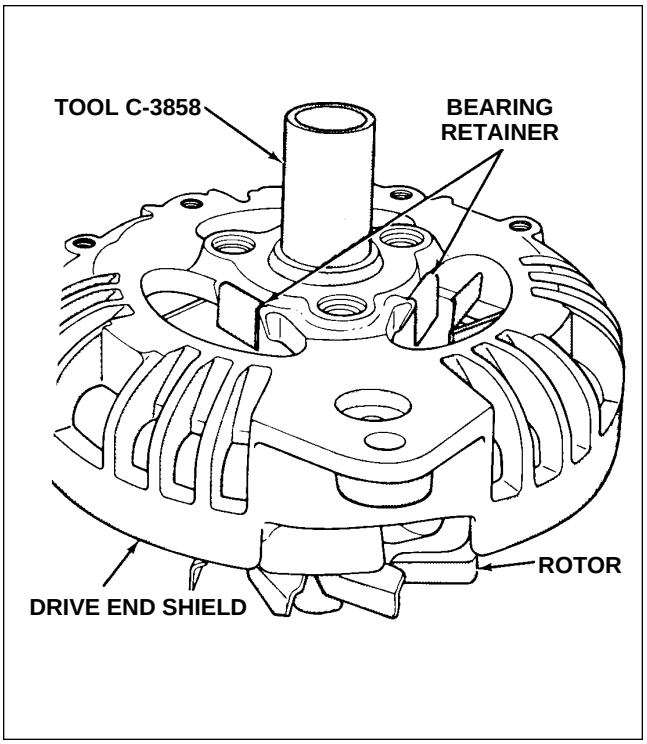


Figure 24-35. Installation of Chrysler Alternator Pulley

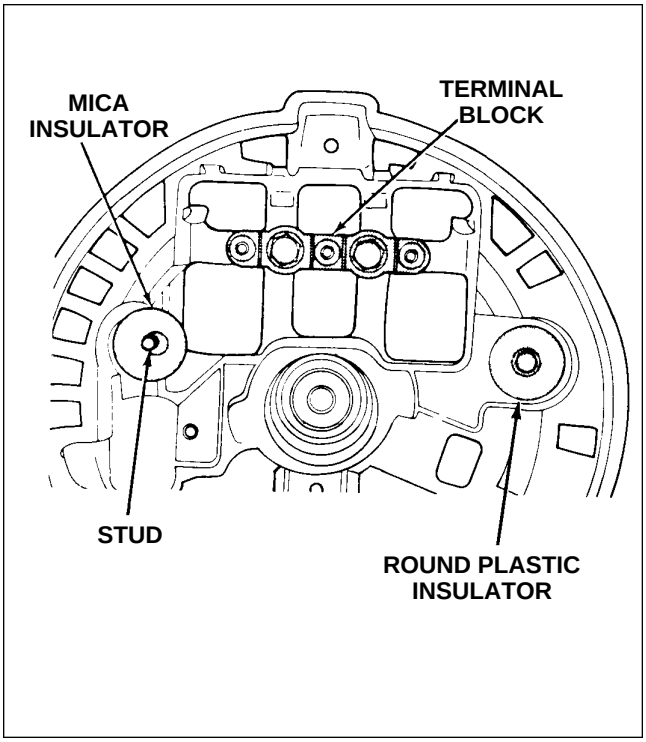


Figure 24-36. Installation of Chrysler Chrysler Alternator

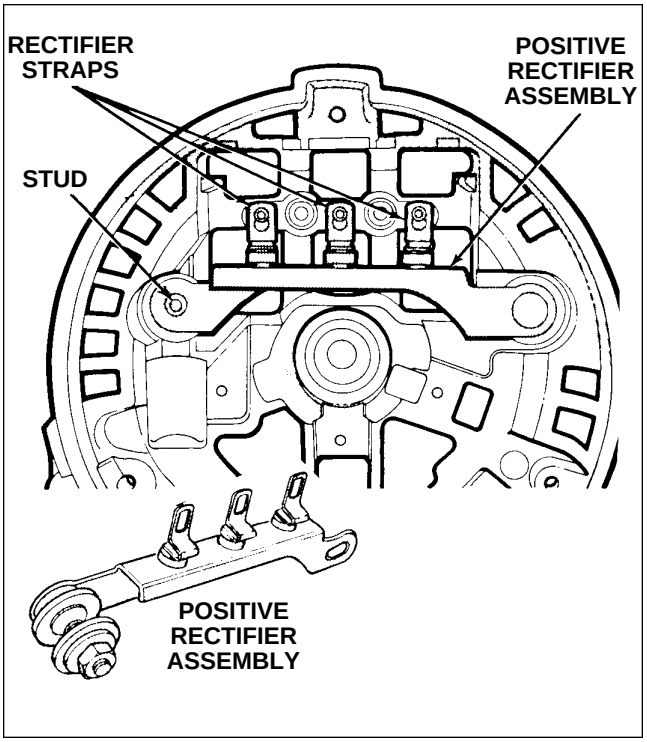


Figure 24-37. Installation of Chrysler Alternator Positive Rectifier Assembly

h. Install positive heatsink assembly by placing battery terminal through round plastic insulator and capacitor end over heatsink mounting stud. Check three rectifier straps are over studs on terminal block. (Refer to Figure 24-37.)

i. Install capacitor terminal over heatsink stud and install capacitor insulator. Verify insulator seats properly in capacitor terminal and heatsink hole.

— NOTE —

On models with S/N PA-28-7690001 thru PA-28-8211034, capacitor is on aft alternator bracket per SPL366A and Kit 764 347. Installed kit will provide improved service life of alternator bracketry and filter capacitor.

j. Secure capacitor bracket to end shield with attachment screw and tighten screw to torque of 30 to 40 inch-pounds.

k. Install positive heatsink nut and lockwasher, and tighten to a torque of 20 to 30 inch- pounds. (Refer to Figure 24-38.)

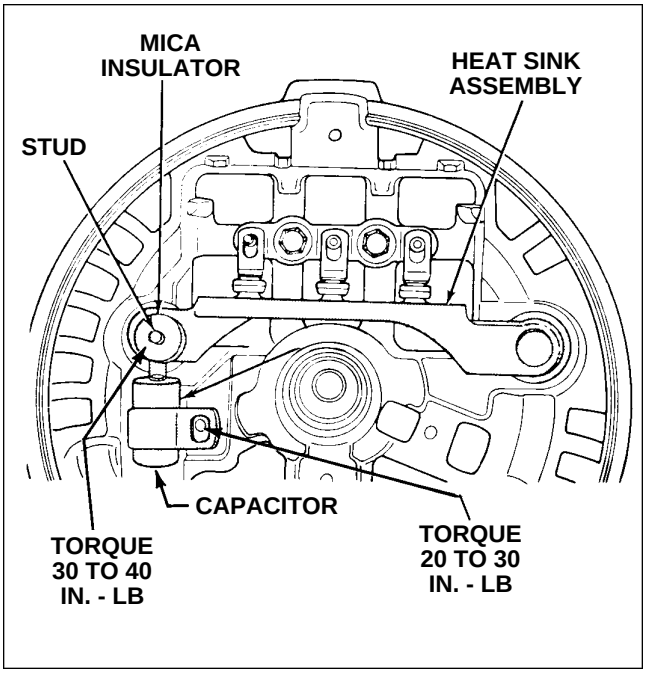


Figure 24-38. Installation of Chrysler Alternator Capacitor

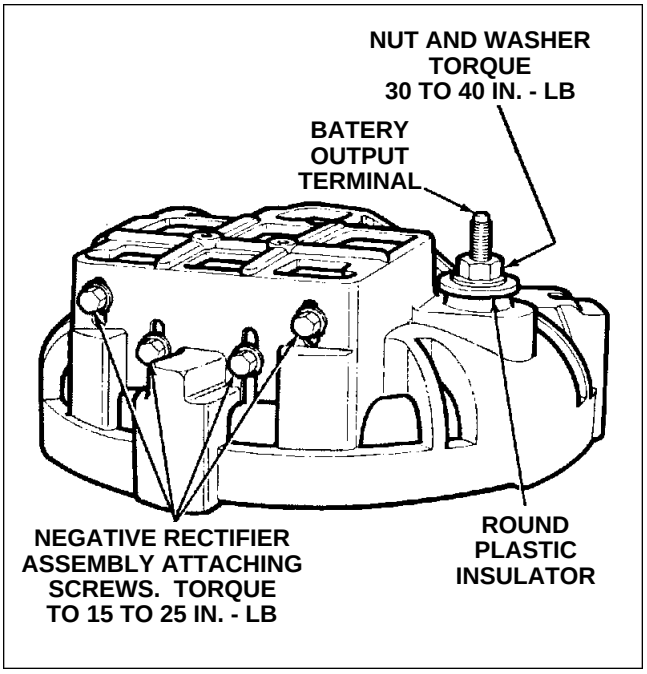

NUT AND WASHER TORQUE 30 TO 40 IN. - LB
BATERY OUTPUT TERMINAL
NEGATIVE RECTIFIER ASSEMBLY ATTACHING SCREWS. TORQUE TO 15 TO 25 IN. - LB
ROUND PLASTIC INSULATOR

Figure 24-39. Installation of Chrysler Alternator Battery Output Insulator

l. Turn end shield over, install round plastic insulator over battery terminal with flat side up. Install nut and washer. Tighten to a torque of 30 to 50 inch-pounds. (Refer to figure 24-39.)

m. Slide negative rectifier and heatsink assembly into place in the end shield with three rectifier straps on terminal block studs.

n. Install hex-head screws through end shield and into heatsink assembly. Tighten to a torque of 15 to 25 inch-pounds.

— CAUTION —

Do not allow stator winding leads to touch rotor or sharp edges of negative heatsink.

o. Position stator over rectifier end shield assembly, and place winding terminals on terminal block studs. Press stator into end shield, and install terminal nuts. Tighten to a torque of 11 to 17 inch-pounds. (Refer to figure 24-40.)
p. Position rotor and drive end shield assembly over stator and rectifier end shield assembly. Align through bolt holes in stator, rectifier end shield, and drive end shield.
q. Compress stator and both end shields manually, install through bolts and washers. Tighten to a torque of 25 to 55 inch-pounds.
r. Place field brushes in insulated holders, and install in rectifier end shield. Place insulating washer on each field brush terminal. Install lockwashers and attaching screws. Tighten to a torque of 15 to 35 inch-pounds.
s. Slowly rotate alternator pulley by hand. Verify rotor fan blades do not contact stator winding leads.
t. Install alternator, and adjust drive belt to specifications.

— CAUTION —

After installing alternator on engine, test complete charging system to verify proper function.

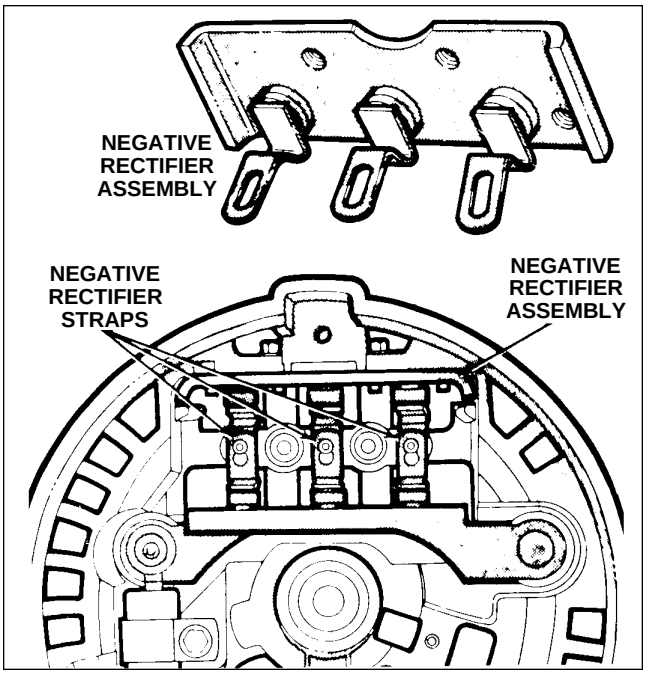


Figure 24-40. Installation of Chrysler Alternator Negative Rectifier Assembly

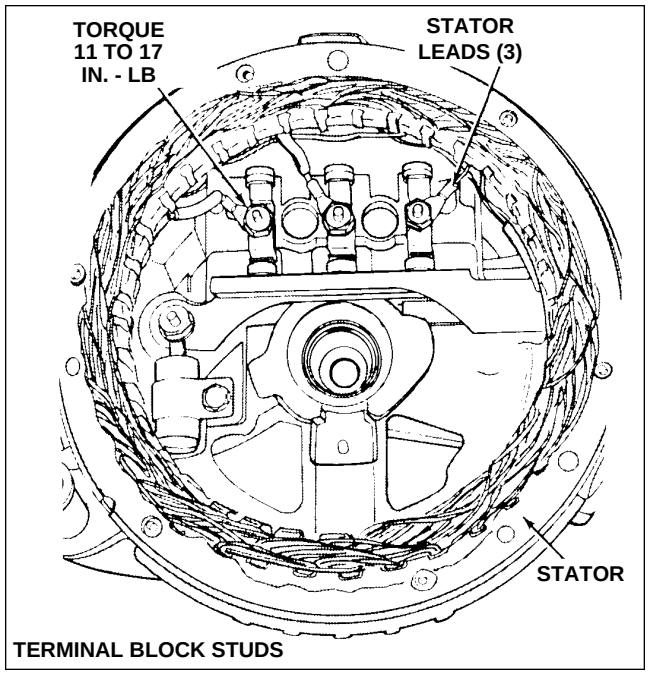


Figure 24-41. Installation of Chrysler Alternator Stator

CHART 2404. CHRYSLER ALTERNATOR SPECIFICATIONS

ALTERNATOR MODEL	CHRYSLER 3656624 or 4111810
Rated Output	60 amperes
Ground Polarity	Negative
Rotation	Clockwise at Drive End
Rotor:	
Current Draw	4.5 to 6.5 amps 12-volts
Resistance	1.5 to 2.0 ohms
Output Test:	
Amperes Output	57 amperes minimum
Voltage	15-volts 1250 Engine rpm

C. ELECTROSYSTEMS 28 VDC, 70 AMP ALTERNATOR (Archer III)

1. Description Of Electrosystems Alternator (Refer to Figure 24-42.)

The principal alternator components are: brush holder assembly, slip ring end head, rectifiers, stator, rotor, and drive end head.

a. The brush and holder assembly contains two brushes, two brush springs, a brush holder, and insulator. One brush is connected to a terminal stud and insulated from ground. The other brush is connected to ground through brush holder. Brush and holder assembly are easily removed for inspection or brush replacement.

b. The slip ring end head provides mounting for rectifiers and rectifier mounting plate, output and auxiliary terminal studs, and brush and holder assembly. Slip ring end head contains a roller bearing, outer race assembly, and a grease seal.

c. The rectifiers used are rated at minimum 150 peak inverse voltage for transient voltage protection. Three positive rectifiers are mounted in rectifier mounting plate while three negative rectifiers are mounted in slip ring end head. Each rectifier pair is connected to stator lead with high temperature solder. Stator leads are anchored to rectifier mounting plate with epoxy cement for vibration protection.

d. The stator contains a special lead connected to center of the three phase windings and is used to activate low voltage warning systems or relays. The stator is treated with a special epoxy varnish for high temperature resistance.

e. The rotor contains slip ring end bearing inner race, and spacer on slip ring end of shaft. Rotor winding and winding leads are specially treated with high temperature epoxy cement to provide vibration and temperature resistance characteristics. High temperature solder is used to secure winding leads to slip rings.

f. The drive end head supports a sealed, pre-lubricated ball bearing in which drive end of rotor shaft rotates.

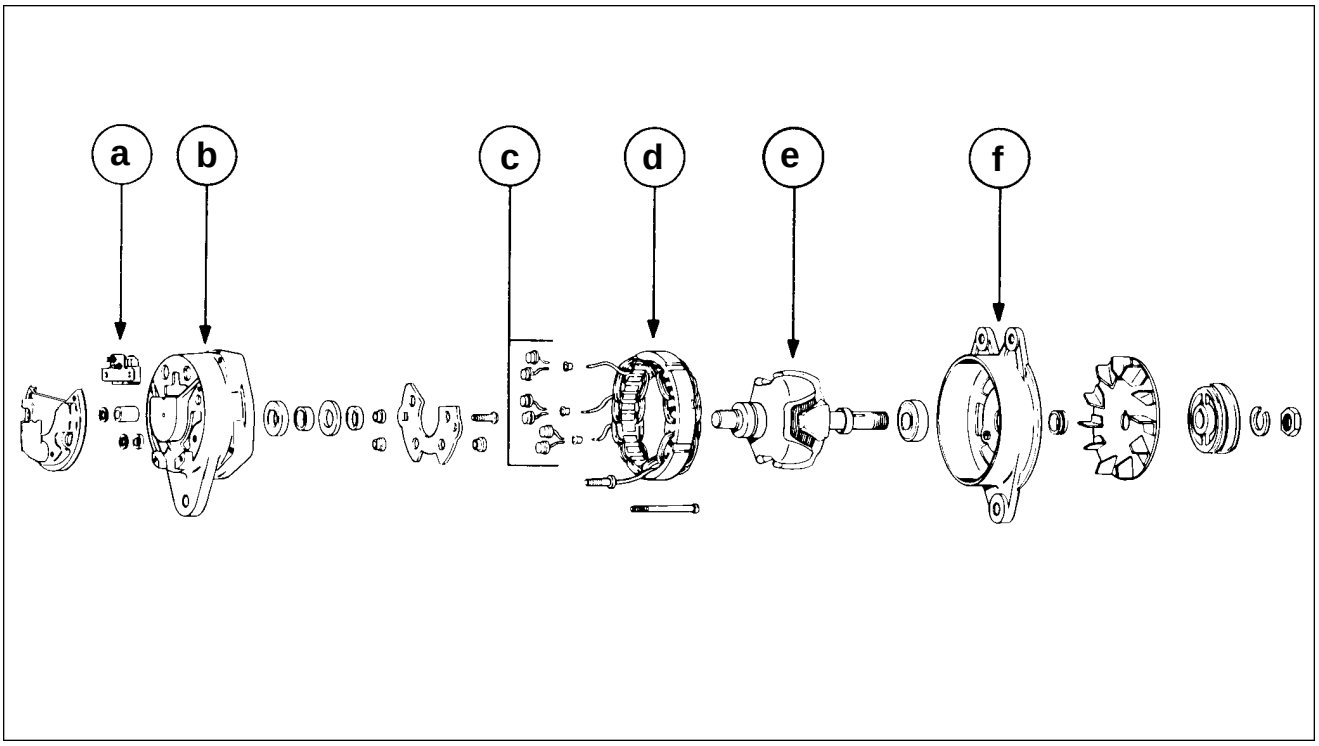


Figure 24-42. Exploded View of Electrosystems Alternator

2. Checking Electrosystems Alternator System

With electrical equipment off (except master switch) the ammeter will read amount of charging current demanded by battery. The amount will vary, depending on percentage of battery charge. As battery is charged, current displayed on ammeter will reduce to approximately two amperes. Current reading on ammeter will show if alternator system is operating normally.

— NOTE —

Current reading on ammeter is the load in amperes demanded by the electrical system from alternator. Check, for example, a condition where battery is demanding 10 amperes charging current, then switch on landing light. Note value in amperes placarded on circuit breaker panel for landing light circuit breaker (10 amps) and multiply by 80 percent. You will arrive at a current of 8 amperes. This is approximate current drawn by the light. When light is switched on, there will be an increase of current from 10 to 18 amperes on ammeter. As each unit of electrical equipment is switched on, current will add up and the total, including battery, will read on ammeter.

Use the example of airplane's maximum continuous load with all equipment on is approximately 60 amperes for 70 ampere alternator. This approximate 60 ampere value, plus approximately two amperes for a fully charged battery, will appear continuously under these flight conditions. If the ammeter reading were to go much below this value, under the aforementioned conditions, trouble with the alternator system would be indicated and corrective action should be taken by switching off the least essential equipment. Locate faulty components as follows:

— CAUTION —

On air-conditioned aircraft, full alternator output on ground must be limited to not more than 10 minutes. Refer to Pilot's Operating Handbook.

a. Check airplane is positioned so prop blast will not interfere with other operations going on near by. Start engine and set throttle for 1000 to 1200 rpm.

b. Switch on the following loads and observe ammeter output increase as follows:

(1) Rotating beacon - 3 to 6 amps.

(2) Navigation and instrument lights - 4 to 6 amps.

(3) Landing lights - 7 to 9 amps each.

If the alternator does not meet the above readings refer to troubleshooting chart 2401. Follow troubleshooting procedure outlined on the chart. Check each cause and isolation procedure under a given trouble.

If desired, the load required by the test can be simulated by connecting 8, 3-ohm, 100-watt resistors wired in parallel from the main bus (+) to airframe ground (-). (Refer to Figure 24-43.)

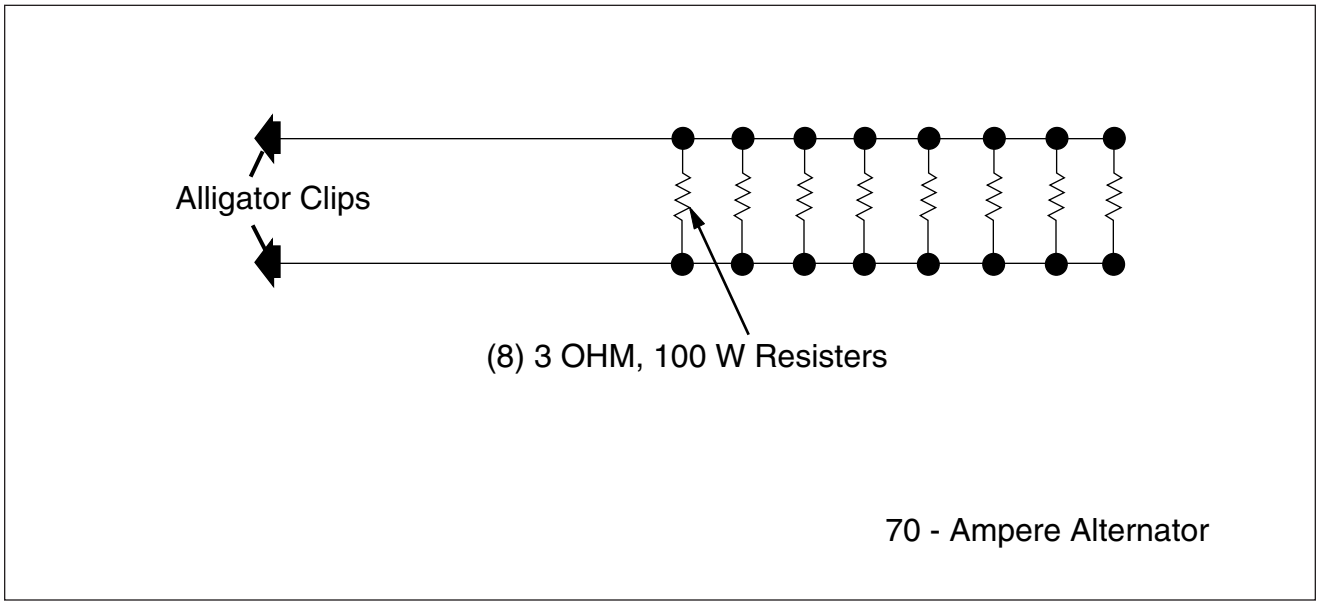


Figure 24-43. Eight Resistor-Bank Load

3. Electrosystems Alternator Service Procedures

The alternator and regulator are designed for use on only one polarity system. Observe the following when testing or servicing the electrical system: (Failure to observe cautions will result in serious damage to electrical equipment.)

— CAUTION —

Disconnect battery before connecting or disconnecting test instruments (except voltmeter) or before removing or replacing any unit or wiring. Accidental grounding or shorting at reg - ulator, alternator, ammeter, or accessories, will cause severe damage to units and/or wiring.

— CAUTION —

Alternator must not be operated on open circuit with rotor winding energized.

— CAUTION —

Do not attempt to polarize alternator. No polarization is required. Polarization will result in damage to alternator, regulator, or circuits.

— CAUTION —=

Grounding alternator output terminal will damage alternator and/or circuit and components.

— CAUTION —

Reversed battery connections will damage rectifiers, wiring, or other charging system components. Battery polarity must be checked with voltmeter before connecting battery. Most aircraft are negative ground.

— CAUTION —

If a booster battery or fast charger is used, polarity must be connected correctly to prevent damage to electrical system components.

4. Overhaul Of Electrosystems Alternator

Complete alternator disassembly is not required for alternator repair. The complete overhaul is covered step-by-step to provide detailed information on each operation. In actual service practice, these operations may be used as required.

5. Disassembly Of Electrosystems Alternator

a. Remove two number 10-24 screws holding brush holder assembly in slip ring end head. Remove brush and holder assembly from end head.

b. Remove safety wire from through bolts. Hold pulley with a strap wrench and remove pulley nut. Pulley must be removed with a puller. Remove fan, woodruff key, and spacer from shaft.

c. Remove four through bolts and tap drive end head lightly to separate drive end head and rotor, as a unit, from stator and slip ring end head.

d. Remove nuts, lock washers, flat washers, and insulators from output and auxiliary terminal studs. (Note carefully the correct assembly of insulator washers and bushings.) Using special tools shown in Figure 24-45, support end head and press out three negative rectifiers. End head can now be separated from stator assembly.

e. To remove slip ring end bearing and grease seal, have a hook type or impact type bearing puller as shown in Figure 24-44. Remove and replace bearing.

— NOTE —

The inner race of slip ring end bearing is pressed onto rotor shaft. When bearing replacement is necessary, replace com - plete bearing assembly, including inner race.

f. To remove drive end head from rotor shaft, use a puller that grips on bearing retainer plate as in Figure 24-46. Do not attempt to remove by supporting end head and pressing on shaft, as this may result in distortion of end head or stripping of retainer plate screws. Remove three retainer plate screws and press bearing out of end head. (Refer to Figure 24-47.)

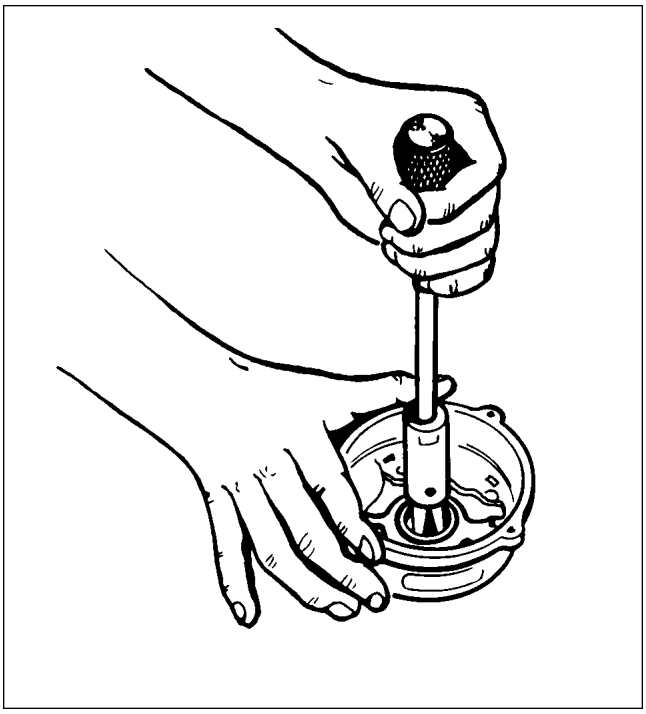


Figure 24-44. Removal of Slip Ring End Bearing (Electrosystems Alternator)

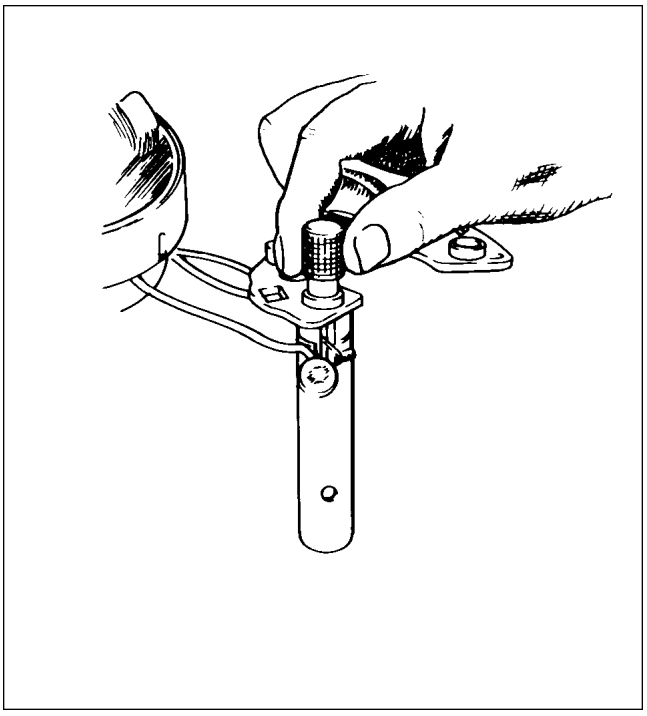


Figure 24-45. Removal of Rectifier (Electrosystems Alternator)

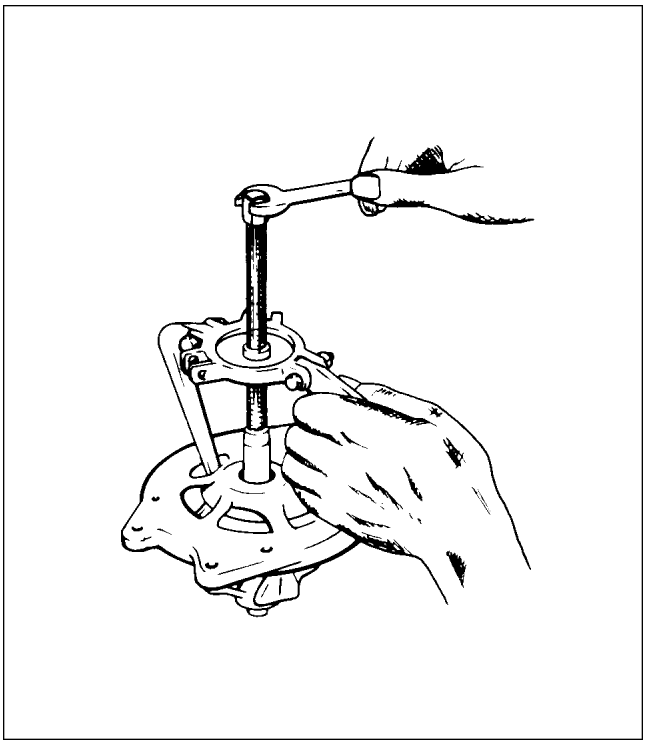


Figure 24-46. Removal of Drive End Head (Electrosystems Alternator)

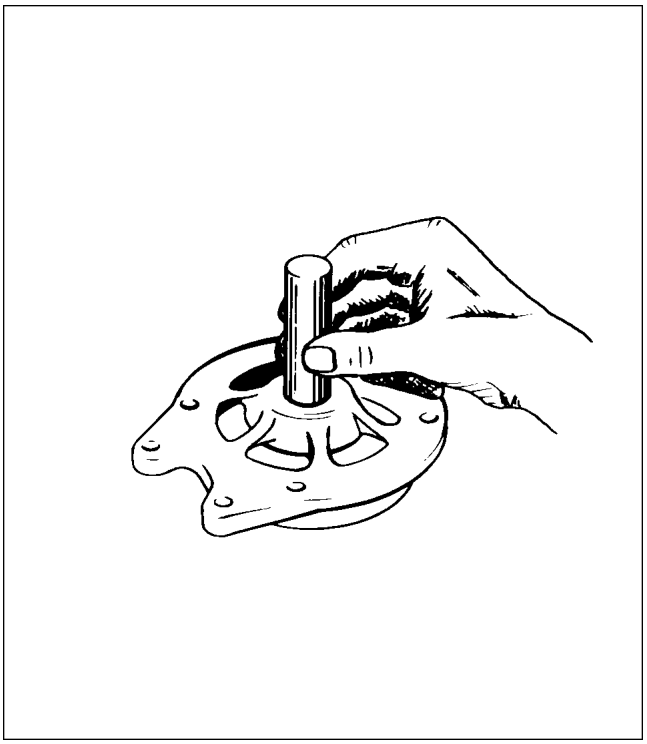


Figure 24-47. Removal of End Head Bearing (Electrosystems Alternator)

6. Inspecting And Testing Components of Electrosystems Alternator

Upon disassembly completion, all parts must be cleaned and visually inspected for cracks, wear, distortion, any signs of overheating, or mechanical interference.

a. Rotor: Rotor must be tested for grounded or shorted windings. Ground test is made with test probes, connected in series with a 110-volt test lamp, an ohmmeter, or any type of continuity tester. (Refer to Figure 24-48.) There must not be continuity between slip rings and rotor shaft or poles. To test for shorted turns in rotor winding, connect a voltmeter, ammeter, and rheostat as in Figure 24-49, or use an ohmmeter. Rotor current draw and resistance are listed in alternator service test specifications paragraph. Excessive current draw or a low ohmmeter reading indicates shorted windings. No current draw or an infinite ohmmeter reading indicate an open winding.

b. Rectifiers: A diode rectifier tester will detect and pinpoint open or shorted rectifiers without disconnecting stator leads. If a tester is not available, test probes and a no. 57 bulb, connected in series with a 12-volt battery can be used as follows:

(1) Touch one test probe to a rectifier heat sink and the other test probe to a lead from one of the rectifiers in that heat sink.

(2) Reverse position of the leads.

— NOTE —

Test bulb must light in one direction and not light in the other direction. If test bulb lights in both directions, one or more of the rectifiers in that heat sink is shorted.

(3) To pinpoint defective rectifier, stator leads must be disconnected and above test repeated on each rectifier.

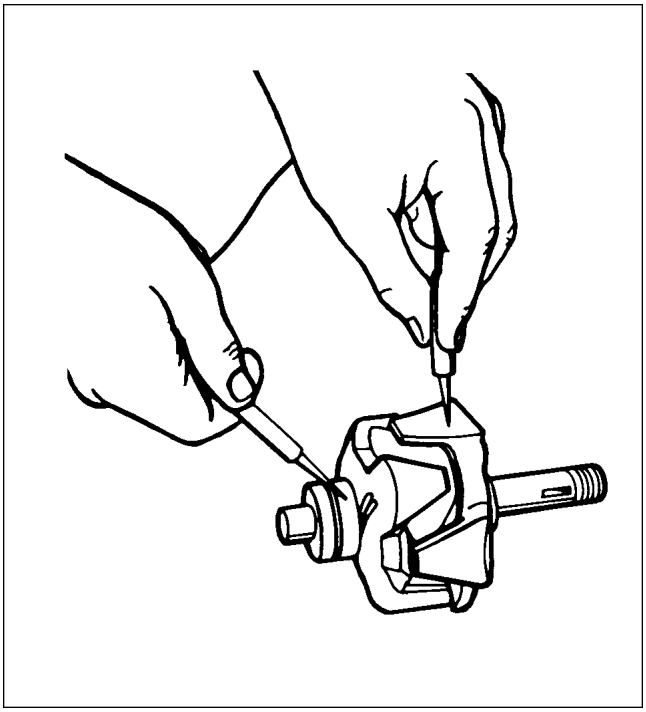


Figure 24-48. Testing Rotor For Ground
(Electrosystems Alternator)

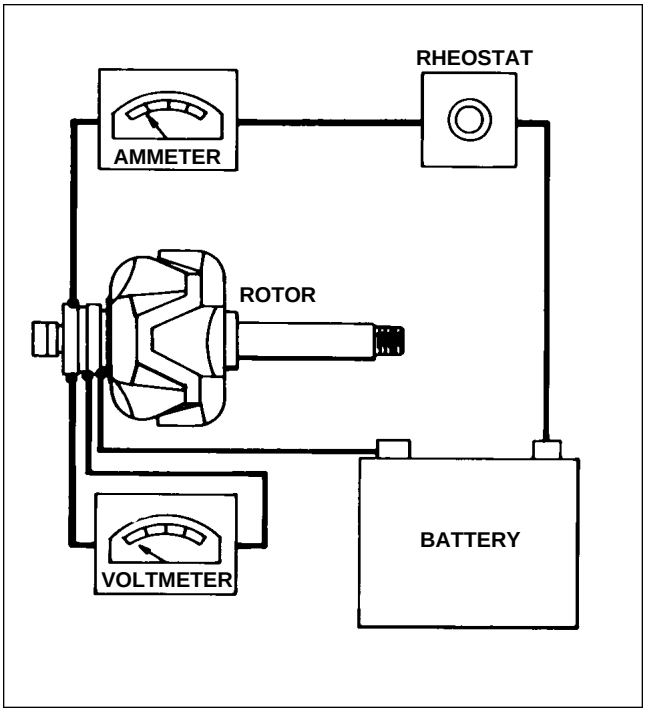


Figure 24-49. Testing Rotor For Shorts
(Electrosystems Alternator)

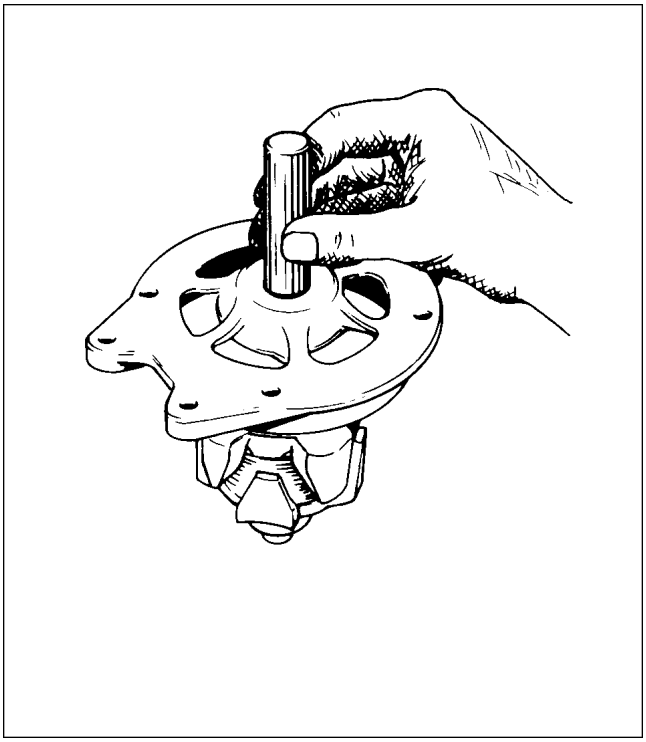


Figure 24-50. Installation of Bearing
(Electrosystems Alternator)

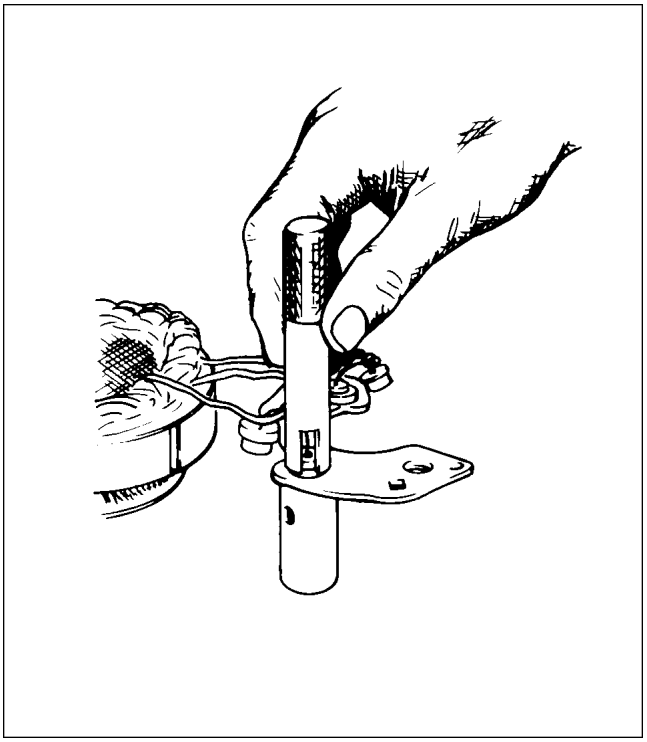


Figure 24-51. Installation of Rectifier
(Electrosystems Alternator)

— NOTE —

Open rectifiers can only be detected, when using test bulb, by disconnecting stator leads. Test bulb will fail to light in either direction if rectifier is open.

c. Stator: The stator is tested for open or grounded windings with a 24-volt test bulb, described in rectifier section, or an ohmmeter, as follows:
   (1) Separate stator from slip ring end head just far enough to insert a fold of rags or block of wood (insulate stator from end head).
   (2) Test for grounded windings by touching one test bulb or ohmmeter probe to auxiliary terminal or any stator lead, and the other test bulb or ohmmeter probe to stator frame. (If test bulb lights, or ohmmeter indicates continuity, stator is grounded.)
   (3) Test for open windings by connecting one test probe to auxiliary terminal or stator winding center connection, and touch each of three stator leads. (Test bulb must light, or ohmmeter must show continuity.)

— NOTE —

Due to low resistance in stator windings, shorted windings are difficult to locate. Shorted stator windings will usually cause alternator to growl or be noisy during operation, and will show signs of overheating. If electrical checks are normal and alternator fails to supply its rated output, stator must be replaced to determine if it is the faulty component.

d. Bearings and seals: When alternator is overhauled, new bearings and oil or grease seals are recommended (even though bearings and seals may appear to be in good condition).

— NOTE —

A faulty seal will cause alternator to fail within a very short period of time.

7. Assembly Of Electrosystems Alternator

a. Press ball bearing into drive end head using a flat block approximately two inch square, so pressure is exerted on outer race of bearing. Install retainer plate. With snap ring and retainer cup in place on rotor shaft, use a tool that fits over shaft and against inner bearing race, and press until inner bearing race is against snap ring retainer cup. (Refer to Figure 24-50.)

— CAUTION —

Use an arbor press, do not hammer. Reconnect stator leads to rectifiers. When soldering connections, use pliers as a heat dam on lead between solder joint and rectifier. Too much heat will damage rectifiers.

b. Carefully install rectifiers in slip ring end head or rectifier mounting plate by supporting unit and using special tools illustrated in Figure 24-51.

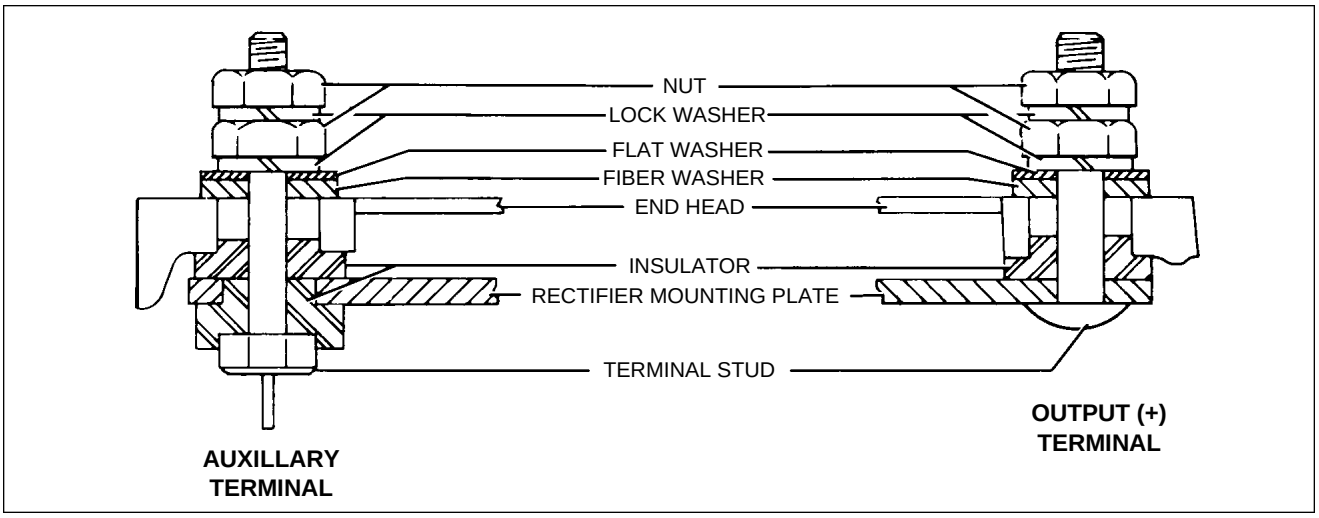


Figure 24-52. Terminal Assembly
(Electrosystems Alternator)

c. Assemble rectifier mounting plate studs and insulators. Verify they are in correct order. (Refer to Figure 24-52.)
d. After slip ring end head is completely assembled, stator and rectifier leads must be secured to rectifier mounting plate with epoxy. Verify stator leads are positioned so they do not interfere with rotor.
e. Install slip ring end bearing and oil seal. Verify oil seal lip is toward bearing. Stake oil seal in place. Assemble bearing, seal, inner race, and spacer as in Figure 24-53.
f. Assemble alternator and install the through bolts. Spin rotor to verify no mechanical interference. Tighten through bolts to torque of 30 to 35 inch-pounds. Safety wire must be installed after unit bench test for output. Install spacer, woodruff key, fan, pulley, lock washer, and nut. Tighten nut to torque of 35 foot-pounds. Use strap wrench to hold pulley.
g. Install brush and holder assembly and retaining screws. Spin rotor and check for interference between brush holder and rotor. Check between field terminal and ground with ohmmeter. Ohmmeter will read rotor resistance. (Refer to Chart 2405, Alternator Specifications.)

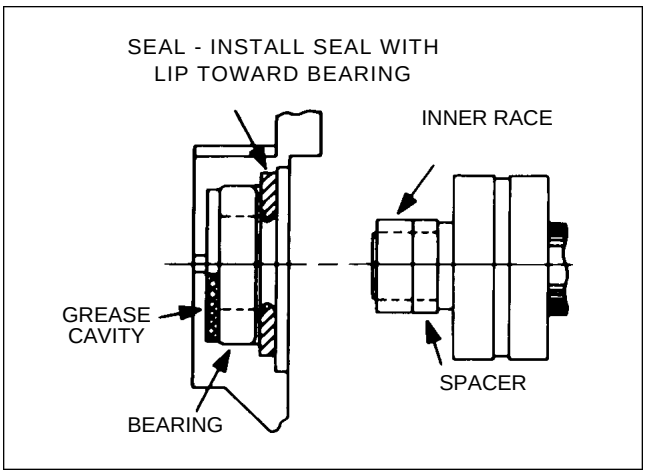


Figure 24-53. Slip Ring End Bearing Assembly
(Electrosystems Alternator)

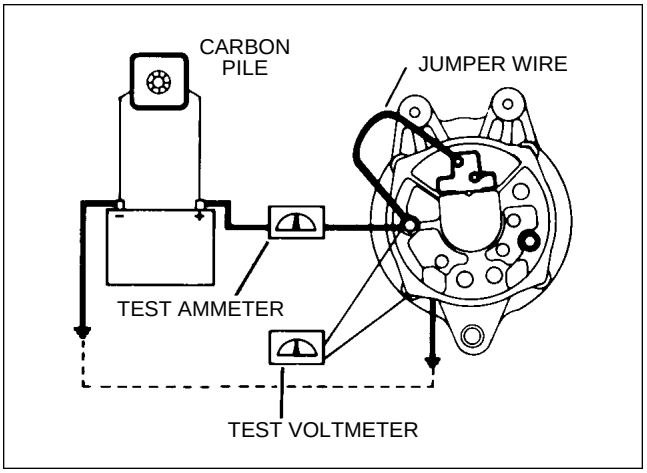


Figure 24-54. Testing Electrosystems Alternator

8. Testing Electrosystems Alternator

a. Wiring connections for bench testing alternator are in Figure 24-54. Refer to Chart 2405 for output test figures. Adjust carbon pile to obtain specified voltage.
b. After bench testing alternator, install safety wire and install alternator.

9. Prestolite Electrosystems Service Tips

a. Bearings: These units have a sealed ball bearing at drive end and a two-piece roller bearing at slip ring end. The inner race is pressed onto rotor shaft and the rest of the bearing is in slip ring end head. When unit is assembled, inner race aligns with bearing. When bearing is replaced, new inner race must be installed on rotor shaft.
b. Lubrication: Slip ring end bearing must be lubricated when alternator is disassembled. Bearing should be thoroughly cleaned and repacked with Cheveron SRI II or equivalent bearing lubricant. Cavity behind bearing must be packed one-third to one-half full with the same lubricant.
c. Brushes: These units have a separate brush holder assembly installed after alternator assembly. Brush holder has a small hole that intersects the brush cavities. Use a pin or wire, as in Figure 24-55 to hold brushes in holder during assembly. Remove pin after brush holder retaining screws are tightened. Check brushes are seated against slip rings.
d. Drive Pulley: Tighten drive pulley retaining nut to a torque of 35 foot-pounds.

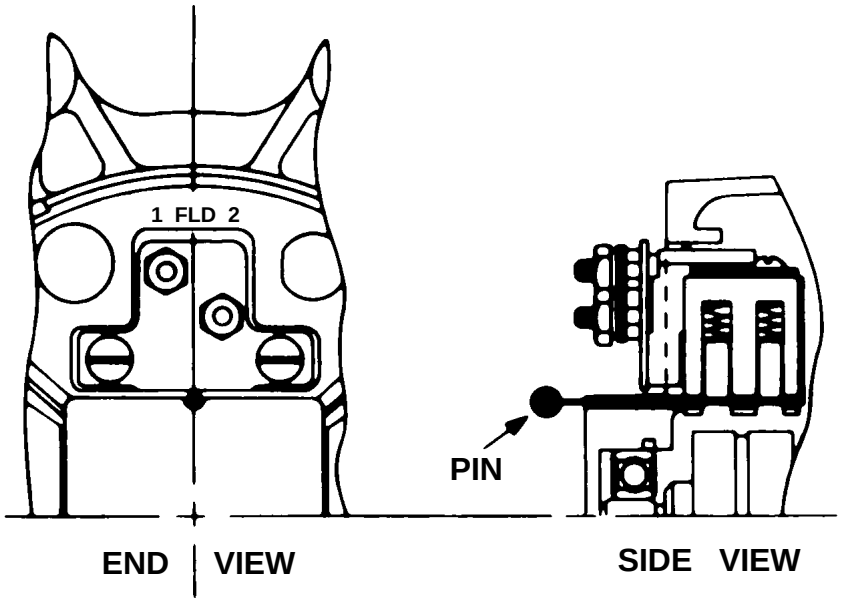


Figure 24-55. Electrosystems Alternator Brush Installation

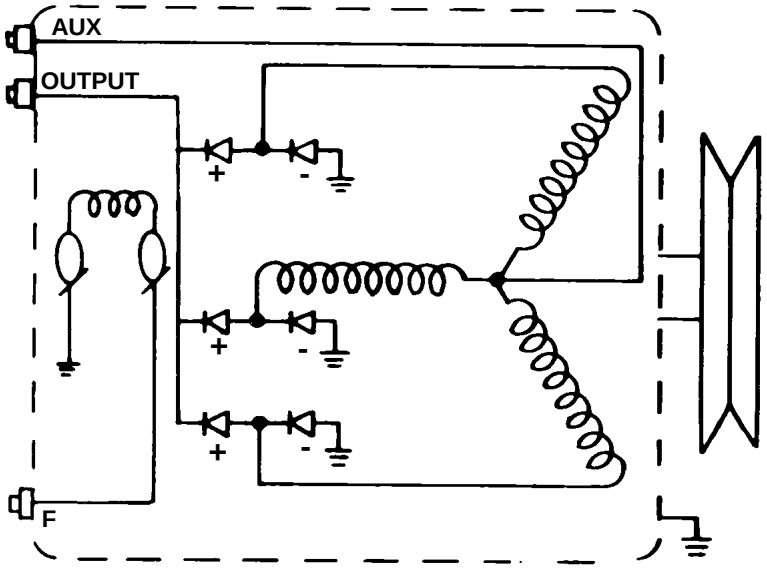


Figure 24-56. Electrosystems Alternator Internal Wiring Diagram

10. Prestolite Alternator Service Test Specifications

CHART 2405. ELECTROSYSTEMS ALTERNATOR SPECIFICATIONS

ALTERNATOR MODEL	ELECTROSYSTEMS ES4032(1)	
Voltage	28-volts	
Rated Output	70 amperes	
Ground Polarity	Negative	
Rotation	Bi-Directional	
Rotor:		
Current Draw	2.4 to 4.0 amps @ 28.0-volts (70°F - 80°F)	
Resistance	7.0- 11.0 ohms (70°F - 80°F)	
Output Test (77° F):		
Volts	28.0	28.0
Amperes Output	25.0	70.0
Alternator rpm	4000 min	6000 min
(1) Air conditioned aircraft		

D. CHECKING ALTERNATOR BELT TENSION

LYC. S.I. 1129A

— CAUTION —

An improperly tensioned belt will wear rapidly, slip, and reduce alternator output. Belt must be checked for proper tension at installation, after first 25 hours operation, and each 100 hours thereafter.

— NOTE —

For aircraft with air conditioning installed, refer to Chapter 21, for replacement and adjustment of compressor drive belt.

There are three acceptable methods of checking alternator belt tension. The first method described is preferred by most maintenance personnel. It is technically simple and requires less time.

1. Torque Method: This method of checking belt tension consists of measuring torque required toslip the belt at the small pulley as follows:

— NOTE —

Chrysler alternators do not have a nut on the shaft, and therefore, cannot be checked by this method.

   a. Apply a torque indicating wrench to the nut attaching pulley to alternator and turn ina clockwise direction. Observe torque shown on wrench at the instant the pulley slips.
   b. Check torque in Step a with torque specified in the following Chart 2406. Adjust belt toproper tension.

CHART 2406. ALTERNATOR BELT TENSION

Width of Belt	Condition	Torque indicated at alternator pulley
3/8 inch	New	11 to 13 ft-lb
Used	3/8 inch	7 to 9 ft-lb
New	1/2 inch	13 to 15 ft-lb
1/2 inch	Used	9 to 11 ft-lb

— NOTE —

Higher tension specified for a new belt will compensate for the initial stretch at the first operation. Higher tension values must not be applied to previously used belts.

2. Deflection Method: Check belt tension by measuring the amount of deflection caused by a predetermined amount of tension as follows:
   a. Attach the hook of a small spring-scale to the belt at the mid-point between rear gear support and alternator.
   b. Pull scale until it reads 14 pounds. (10 pounds for used belts.)
   c. Measure the distance the belt moved with the 10 or 14 pound load. The distance (deflection) must be 5/16 inch. If less than 5/16 inch, belt is too tight.

3. Use a belt tension gauge such as the Burroughs deluxe model or equivalent. AVCO-LYC. S.L. L160
   a. Attach gauge over the belt per manufacturer's instructions.
   b. Quickly release handle and read tension.
   c. Repeat steps a and b several times to eliminate the possibility of an inaccurate reading.

— NOTE —

Slight variations in readings taken at different locations on the belt are normal.

   d. If a new belt is installed, set tension 25 percent above operating range to allow for stretch that will occur as soon as belt is operated.
4. Complete alternator belt tension adjustment, and tighten alternator pivot bolts to a torque of 225 to 255 inch-pounds.

E. BATTERY

1. Archer II

a. Servicing Battery

— CAUTION —

Battery fluid must not be filled above baffle plates.

Access battery through the aft side of the baggage compartment. It is in a protective box with vent system and drain. Vents allow fresh air into box and draw off fumes from the charging process of battery. The drain is clamped off and must be opened occasionally to drain liquid. (Serial numbers 28-8690048 to 28-8690056 and serial numbers 2890001 and up have an uncapped center vent.) Battery must be checked for fluid level. Check with hydrometer to determine the percent of charge in the battery. All connections must be clean and tight.

b. Removal Of Battery

— CAUTION —

Always remove the ground cable first and install it last to prevent accidental short circuiting or arcing.

(1) Remove the access panel to aft section of fuselage.
(2) Remove battery box cover.
(3) Disconnect battery straps.
(4) Disconnect the battery cables.
(5) Lift battery from box.

c. Installation Of Battery

— CAUTION —

Check battery vent tubes for obstructions. Remove obstructions to ensure positive air flow through battery box.

(1) Check battery and battery box are clean and free of acid.

(2) Install battery in box.
(3) Connect positive lead to positive battery terminal and secure.
(4) Connect ground cable to negative battery terminal and secure.
(5) Connect and tighten battery straps.
(6) Install battery box cover and secure with wing nuts.
(7) Install access panel.

d. Testing Battery

The specific gravity check method is in Chart 2407. If alternator output is known to be correct,battery capability can be more accurately determined with a load type tester.

e. Charging Battery

If battery is below normal charge, remove battery and recharge. Begin with a charging rate of 4 amps and finishing with 2 amps. A fast charge is not recommended.

CHART 2407. HYDROMETER READING AND BATTERY CHARGE PERCENT
ARCHER II, 12 VOLT BATTERY

Hydrometer Reading	Percent of Charge
1.280	100
1.250	75
1.220	50
1.190	25
1.160	Very little useful capacity
1.130 or below	Discharged

f. Battery Box Corrosion Prevention

The battery must be checked for spilled electrolyte or corrosion at least each 50 hour inspection or at least every 30 days, whichever comes first. If electrolyte or corrosion is in box, on terminals, or around the battery, battery must be removed and cleaned. Clean box and battery as follows:

— CAUTION —

Serial numbers 28-8690048 to 28-8690056 and serial numbers 2890001 and up have an uncapped center vent. Verify angled face of center vent is facing aft, to ensure positive air flow through battery box.

(1) (Serial numbers 28-7690001 to 28-8690047) Remove battery box center vent cap from underside of fuselage. Drain off any electrolyte overflow in box.

— CAUTION —

Do not allow soda solution to enter battery.

(2) Clean battery and box. Neutralize corrosion effects by applying a solution of baking soda and water mixed to a consistency of thin cream. Apply this mixture until all bubbling action has ceased.

(3) Rinse battery and box with clean water, and dry.

— CAUTION —

Check battery vent tubes for obstructions. Remove obstructions to ensure positive air flow through battery box.

(4) (Serial numbers 28-7690001 to 28-8690047) Place cap over center battery box vent.
(5) Install battery.

2. Archer III (S/N's 2890206 and up)

— CAUTION —

Battery fluid must not be filled above bottom of the split ring.

Access battery through the aft side of the baggage compartment. It is in a protective box with vent system that incorporates a lead acid recovery jar. To draw off fumes produced during the battery charging process, the jar is vented overboard through a vent tube in the floor of the airplane, . Any electrolyte overflow will be captured by the jar to be disposed of in an approved manner during servicing.

a. Battery Removal

— CAUTION —

Always remove the ground cable first and install it last to prevent accidental short circuiting or arcing.

(1) Remove the access panel to aft section of fuselage.
(2) Cut ty-wrap and remove vent jar tube from ***battery elbow***.
(3) Pull back rubber battery terminal boot on positive cable, loosen wing nuts and remove both the positive and negative cables.
(4) Remove the two each AN3-73A bolts, AN970-3 washers, and 84316-2 insulators securing battery cover. Remove cover.
(5) Remove battery

b. Removing Acid Recovery (Vent) Jar

— CAUTION —

Do not remove either vent hose from vent jar cap.

(1) Remove two MS35207-264 screws and AN960-10 washers securing jar to battery bracket assembly.
(2) Carefully position jar so that it can be unscrewed from the jar top.
(3) Remove jar from airplane.

— CAUTION —

Check battery vent tubes leading to and from vent jar for obstructions. Remove obstructions to ensure positive battery box ventilation. Replace only with special acid proof hoses specified in Parts Catalog.

c. Cleaning Battery

(1) Remove all accumulated contamination from the battery exterior with a stiff bristle brush. (Do not use a metal brush or abrasive materials.) Wipe exterior of battery and interior of manifold, including manifold top cover, with a cloth saturated with a solution of bicarbonate of soda mixed - one part soda to twenty parts of water. (Check that cell plugs are tight - do not allow soda solution to enter any cells.)
(2) Wash entire battery with clear water and dry thoroughly.
(3) Wash down the battery support and floor area, hold down supports, connectors and cable ends with a soda solution followed by clear water. Dry entire area and component parts thoroughly. Apply fresh acid resistant paint if required.

d. Cleaning Acid Recovery Jar and Vent Lines

(1) Visually inspect all vent lines for kinks, cracks, flexibility, and loose connections. Replace only with special hoses from parts manual. ***(DO NOT REPLACE WITH ORDINARY RUBBER HOSE.)***
(2) Slowly pour the soda solution into the vent hose, still attached to fuselage floor vent, using a small funnel. The solution will flow out the fuselage vent.
(3) Follow with a final purge of clear water to flush the vent line and then blow dry with low pressure air. This ensures that the vent line is not kinked or restricted and that it is neutralized.
(4) Wipe down the lower fuselage area surrounding the vent with soda solution and clear water. Apply a fresh coat of high quality aircraft wax to entire area.
(5) Unscrew the bottom of the recovery jar and separate from the top. (Refer to paragraph 2, b.) Remove jar pad and empty jar contents into suitable container for safe disposal.
(6) Thoroughly wash and neutralize the jar, pad, top (including bracket), and the short length of vent hose still attached to the jar top with a soda solution and a clear water rinse.
(7) Thoroughly dry all components and recharge the jar with 0.75 of an inch of bicarbonate of soda. Place dry jar pad in the jar on top of the soda charge.
(8) Screw jar back together and keep it in a vertical position.
(9) Install in aircraft per installation instructions. (Refer to paragraph 2, d.)

e. Battery Installation

(1) Check battery and battery tray are clean and free of acid.
(2) Position battery in battery tray.
(3) Install vent jar tube to ***battery elbow.*** Secure with an MS3367-4-9 ty-wrap.

— CAUTION —

Do not tighten battery cover hold down bolts more than 10 inch-pounds.

(4) Install battery cover and secure with two each 84316-2 insulators, AN970-3 washers, and AN3-73A bolts.
(5) Connect ground cable to negative battery terminal and secure.
(6) Connect positive lead to positive battery terminal and secure.
(7) Install the access panel to aft section of fuselage.

f. Installing Acid Recovery (Vent) Jar

(1) Carefully position jar top so that jar can be screwed into it.
(2) Attach jar to lid.
(3) Attach jar assembly to battery bracket using two each MS35207-264 screws and AN960-10 washers.

g. Battery Charging - (Gill Model G-243)

The National Electric Code forbids charging batteries installed in aircraft or within 10 feet of fuel tank areas. The battery must be removed from the aircraft for charging. Further, an aircraft battery should not be allowed to deteriorate to the point where safety of flight is jeopardized. The batteries emergency capacity should be sufficient to power the essential bus for a minimum of thirty minutes.

(1) Remove cell plugs and ensure that vents in plugs are open and that vent valves operate freely.
(2) Check that the electrolyte level in each cell is at the bottom of the split ring.
(3) A hydrometer check of each cell should be accomplished. (Refer to "Hydrometer Reading and Battery Charge" in this chapter.)

— CAUTION —

If charging is necessary wear eye protection - don't take chances. Also make sure the charging area is well ventilated. If central air conditioning is used, the battery charging area should be vented to the outside air to prevent hydrogen gasses from being circulated throughout the building.

(4) It is recommended that vent caps be left on the battery while charging. In addition a wet cloth should be placed over the vent caps within the manifold.
(5) The battery may be charged at any rate, in amperes, not to exceed that point which would produce bubbling and gassing of the electrolyte or a cell temperature of 115° F in any case.

— NOTE —

If a cell temperature reaches the 115° F. limit, the charging rate shall be reduced and the charge completed at 3 amperes or less. DO NOT CHARGE AT A HIGHER RATE WHEN CELLS ARE GASSING. Refer to Gill Service Manual G.S.M.-682 for alternate charging methods and service proce - dures.

(6) If a constant current (recommended) charge is available, the charge should be started at 3 amperes and reduced in half if and when cells start gassing until fully charged.
(7) As charging occurs, if any cells sputter or flood, the electrolyte level is too high and the excess must be removed. In any case the electrolyte level shall be adjusted at the end of the charge. The level will rise due to acid returning to the electrolyte mix, normal gassing, and expansion due to temperature rise.

(8) Thoroughly clean battery after charging to prevent remaining acid bridges which can form during charging.

— NOTE —

Never allow lead acid batteries or tools used on them to be near Ni-Cad batteries and Ni-Cad battery tools.

h. Hydrometer Reading and Battery Charge

Whenever checking the battery, ascertain that all connections are clean and tight and that the fluid level is above the baffle plates. If it is necessary to add fluid, fill cell with distilled water to the bottom of the split ring. After adding water, charge the battery until gassing before taking a hydrometer reading. Otherwise, the water and electrolyte will not be mixed, giving a false reading. Temperatures different from the established norm will effect the hydrometer readings. Refer to Chart 3 for the temperature corrections. Specific gravity values for a fully charged battery are as follows:

To adjust low specific gravity, charge the battery (see Charging Battery) until it is gassing and until the specific gravity rises no higher over a 3-hour period. Then remove some electrolyte and replace with 1.300 specific gravity electrolyte. Repeat this step if, after one hour of charging, the specific gravity is still too low. DO NOT ADJUST A CELL THAT DOES NOT GAS.

To adjust high specific gravity, charge the battery (see Charging Battery) until it is gassing and until the specific gravity rises no higher over a 3-hour period. Remove some electrolyte and replace with distilled water. Repeat this step if, after one hour of charging, the specific gravity is still too high.

— CAUTION —

In the operation of the battery, gases are formed which may be explosive if ignited. Never create sparks of any kind or bring an open flame near the battery. Ventilate the battery when charging to dispose of the gas generated by the battery.

CHART 2408. HYDROMETER READING AND BATTERY CHARGE PERCENT
ARCHER III, 24 VOLT BATTERY

Hydrometer Reading	Percent of Charge
1.285 to 1.295	100
1.250	75
1.217	50
1.184	25
1.150	Discharged

CHART 2409 ELECTROLYTE TEMPERATURE CORRECTIONS

Electrolyte Temperature	Specific Gravity
47° F	1.280 to 1.300
77° F	1.280 to 1.290
107° F	1.260 to 1.280
Temperature change of 30° F changes the reading 0.010.	

CHART 2410 SPECIFIC GRAVITY TEMPERATURE CORRECTION

Electrolyte Temperature			
°C	°F	Correction	
60	140	1.024	
55	130	1.020	
49	120	1.016	Add to
43	110	+.012	Reading
38	100	+.008	
33	90	+.004	
27	80	0.000	
23	70	-.004	
15	60	-.008	
10	50	-.012	
5	40	-.016	Subtract
-2	30	-.020	From
-7	20	-.024	Reading
-13	10	-.028	
-18	0	-.032	
-23	-10	-.036	
-28	-20	-.040	
-35	-30	-.044	

i. Battery Discharge

The capacity of a storage battery is measured in units of ampere hours, which is the product of the electrical current in amperes multiplied by the time in hours. Although current may be obtained after the end of the time, the voltage of the battery has dropped to a point beyond which it is not very useful. The ampere hours which may be obtained from a battery are greater for a long low-rate or intermittent rate discharge than for a short high-rate discharge because the voltage will drop faster at the higher discharge rate. The maximum permissible rate of discharge is limited only by the current-carrying ability of the wiring, motor, or other apparatus to which the battery is connected or by the current-carrying ability of the cell terminals and connectors and not by the plates themselves. Listed below are recommended discharge rates:

CHART 2411 DISCHARGE RATE

TELEDYNE Battery Type	Volts	(5 HRS.) Ampere Hours
GILL-G243	24	15.5

THIS SPACE INTENTIONALLY LEFT BLANK

j. Battery Temperature Considerations

Operation of storage batteries beyond their ambient temperature or charging voltage limits will result in excessive cell temperatures leading to electrolyte boiling, rapid deterioration of the cell, and finally battery failure. The relationship between the maximum charging voltage and the number of cells in the battery is also significant, since this will determine (for a given ambient temperature and state of charge) the rate at which energy is absorbed as heat within the battery. The maximum voltage per cell should not exceed 2.35 - volts, and the maximum temperature should not exceed 115° F.

Low electrolyte temperatures temporarily reduce the battery capacity and the freezing point depends on the specific gravity. To prevent freeze damage, maintain the specific gravity at a reasonably high level as indicated by Chart 6.

— NOTE —

Lead-acid batteries are subject to a constant discharge due to the internal chemical action.

CHART 2412 ELECTROLYTE FREEZING POINT

	Freezing Point	
Specific Gravity	°C	°F
1.300	-70	-95
1.275	-62	-80
1.250	-52	-62
1.225	-37	-35
1.200	-26	-16
1.175	-20	-4
1.150	-15	5
1.125	-10	13
1.100	-8	19

k. Battery Repairs, Storage, and Service Tips

The internal parts of the battery have been designed to wear at approximately the same rate, making it uneconomical to replace any of the parts with new ones. Replacing the entire battery is simpler and cheaper.

Before storing the battery, it should be properly charged, the vent plugs put tightly in place, and the leads disconnected to prevent use during idle periods. The battery should be charged at intervals during the idle period. Before returning the battery to service, it should be thoroughly charged. The battery will be sufficiently charged when, after a 3-hour period, the specific gravity does not rise any higher with the electrolyte gassing and a charging rate of 1-1/2 amperes.

Long battery life and trouble-free service is obtained from the battery if the following simple tips are observed:

(1) Keep it clean.
(2) Keep it charged.
(3) Maintain proper electrolyte levels.
(4) Keep specific gravity equal among all cells.

l. Preparing New Dry Charged Battery for Installation

The Teledyne, dry-charged, Model GILL/G-243 Battery shall be stored as received from Teledyne. Do not remove vent seals, add acid, nor attempt to charge a dry-charged battery until the time arrives to install the battery into an airplane.

— CAUTION —

Prior to installing a new dry-charged battery, follow the preparation installation instructions furnished with the battery by Teledyne.

F. CHECKING VOLTAGE REGULATOR

The regulator is a fully transistorized unit. The components are encapsulated in epoxy, making field repair of the unit impractical. Before performing any of the following checks on either the 14 Vdc or 28 Vdc regulator, verify proper functioning of the alternator per manufacturer's instructions. If it does not meet the specifications, the alternator must be replaced.

1. To test the 14 Volt regulator:

a. Use only a good quality, adjustable dc power source.
b. This test must be accomplished with the regulator out of the circuit.
c. Connect regulator into circuit after completing test.

— CAUTION —

When testing the alternator control with an operating alterna - tor, never bypass the regulator bus to field (RED to BLUE) to check operation of the alternator or the overvoltage protection action.

d. Use two quality, accurate voltmeters with at least a 15-volt scale.

— CAUTION —

Ambient temperatures surrounding voltage regulator must be between 50°F and 100°F.

— CAUTION —

Do not connect the voltmeter across the battery. The regulator is designed to compensate for resistance in wiring harness.

(1) V1 Connections.
  (a) Connect positive voltmeter lead to red wire (supply) at regulator harness connector or terminal block.
  (b) Connect negative voltmeter lead to regulator ground wire (black).
(2) V2 Connections
  (a) Connect positive voltmeter lead to blue wire (field) at regulator harness connector or terminal block.
  (b) Connect negative voltmeter lead to regulator ground wire (black). Incorporate a 1000 ohm, 1/2 watt resistor into the circuit. (Refer to figure 24-57.)

e. In the regulation check procedure, connect R end of resistor to the common ground wire (black).
f. Increase voltage to regulator and monitor both V1 and V2.
   (1) As V1 increases from a low value, V2 should follow V1 at a reading only slightly less than V1.
   (2) Values must read between 13.6 and 14.3 volts.
g. As the regulation point of a properly functioning control unit is approached, V2 will peak, decreasing rapidly with further increase of V1 until V2 goes to zero. The change of V1 from peak V2 to zero V2 may be about one-half of a volt.
h. If regulator does not regulate between 13.6 and 14.3 volts, one of the following conditions may exist:
   (1) Regulates out of specification. (Regulator is out of calibration and must be replaced.)

— NOTE —

The 68804-04 (Lamar) regulator has a black ground wire that must have a low resistance connection to the ground system. It is adjustable and must be set to 14.0 volts.

   (2) The voltmeter continues to read battery voltage.
      (a) Poor or open connections within wiring harness.
      (b) The regulator is open.
   (3) Voltage continues to rise.
      (a) Regulator housing not grounded.
      (b) Regulator shorted, must be replaced.
i. In case of failure check for:
   (1) Poor or loose connections.
   (2) Poor ground on regulator housing.
   (3) Shorted alternator windings.
   (4) A grounded wire.
   (5) Disconnecting the regulator while circuit is energized.
   (6) Open circuit operation of alternator. (Battery disconnected).

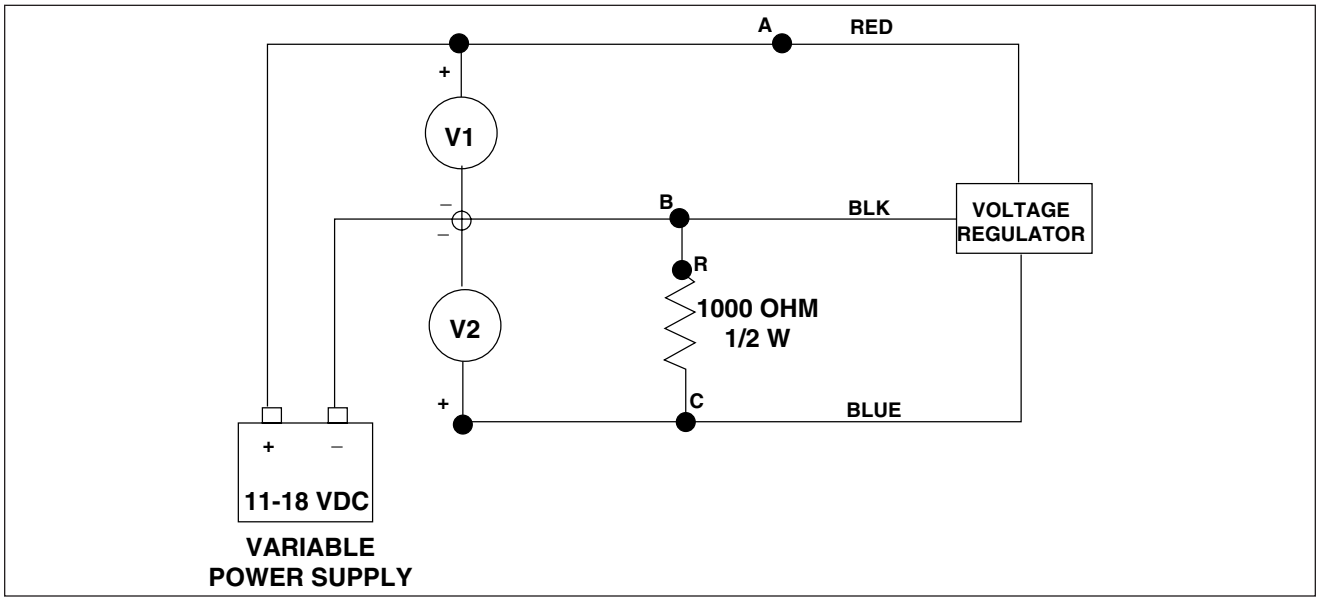


Figure 24-57. Lamar 14 Vdc Regulator Check

2. 14 Vdc System Regulator Overvoltage Check

The Lamar regulator has an incorporated overvoltage relay. To check relay operation use the same test connections as testing the regulator, except the R end of resistor must be connected to the RED wire at the regulator harness connector or terminal block. (Refer to figure 24-58.) Test as follows:

a Increase voltage to circuit slowly. Monitor both V1 and V2 until V2 suddenly drops.

b Sudden V2 voltage drop indicates overvoltage circuit has tripped.

c Overvoltage control is set to operate between 16.0 volts and 19.0 volts. If overvoltage control does not operate between values indicated it must be replaced.

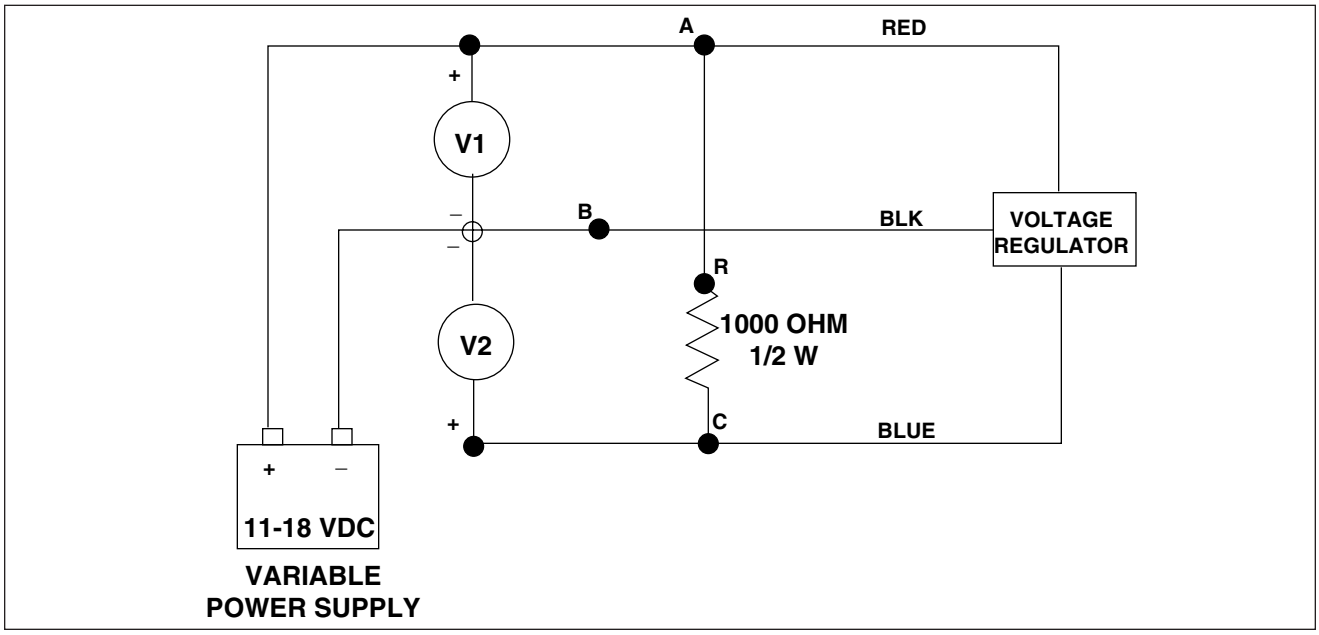


Figure 24-58. 14 Vdc System Lamar Overvoltage Check

3. Checking Overvoltage Relay (*14 Vdc System Only*)

Test relay with a good quality, accurate voltmeter (20 volt scale), and a suitable power supply (20 volt output), or sufficient batteries with a voltage divider to regulate voltage. Connect test equipment as follows:

a. Connect B to BAT of the overvoltage control.

b. Connect B- to overvoltage control frame.

c. Check connections are secure, and connected to a clean, bright surface.

d. Connect voltmeter positive lead to BAT terminal of the overvoltage control.

e. Connect voltmeter negative lead to overvoltage control frame.

f. Overvoltage control is set to operate between 16.2-volts and 17.3-volts. By adjusting the voltage, click will be heard when relay operates.

g. If overvoltage control does not operate between 16.2 and 17.3-volts, it must be replaced.

4. To test the 28 Volt regulator:

a. Use only a good quality, adjustable dc power source.

— CAUTION —

All tests must be accomplished with the regulator out of the circuit.

b. Use a quality, accurate voltmeters with at least a 35-volt scale.

— CAUTION —

Ambient temperatures surrounding voltage regulator must be between 50°F and 100°F.

(1) Voltmeter connections. (Refer to Figure 24-59.)
   (a) Connect positive voltmeter lead to red wire (supply) at regulator harness connector or wire .
   (b) Connect negative voltmeter lead to regulator ground wire (black).
(2) Light Bulb Connections. (Refer to Figure 24-59.)
   (a) Connect one bulb lead to blue wire (field) at regulator harness connector or wire.
   (b) Connect other bulb lead to regulator ground wire (black).
(3) In the regulation check procedure, increase voltage to regulator and monitor both the voltmeter and bulb.
(4) As the regulation point of a properly functioning control unit is approached, the bulb will blink OFF and ON. At regulation, the bulb will be ON continuously.
(5) If regulator does not regulate to 28 Volts, it is out of calibration, and must be replaced.

c. If regulator checks good, check airplane for:
(1) Poor or loose connections.
(2) Poor ground on regulator housing.
(3) Shorted alternator windings.
(4) A grounded wire.

d. After completing test, connect regulator into circuit

5. 28 Vdc System Regulator Overvoltage Check

The Lamar regulator has an incorporated overvoltage relay. To check relay operation use the same test connections as testing the regulator, except connect the bulb across the RED and BLUE wires. (Refer to figure 24-60.) Test as follows:

(1) While monitoring both the voltmeter and the light bulb, increase voltage to circuit slowly to 32 volts.
(2) After a slight delay, the bulb will light.
(3) If overvoltage control fails to operate at 32 Vdc, it must be replaced.

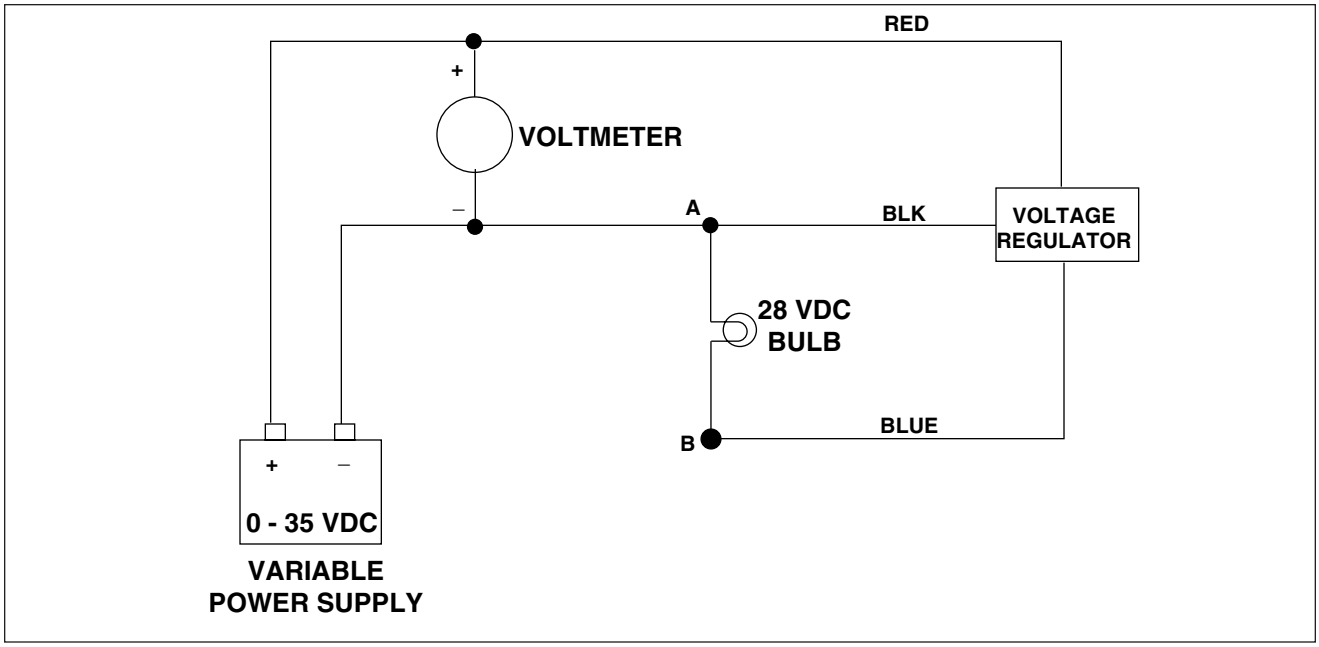


Figure 24-59. Lamar 28 Vdc Regulator Check

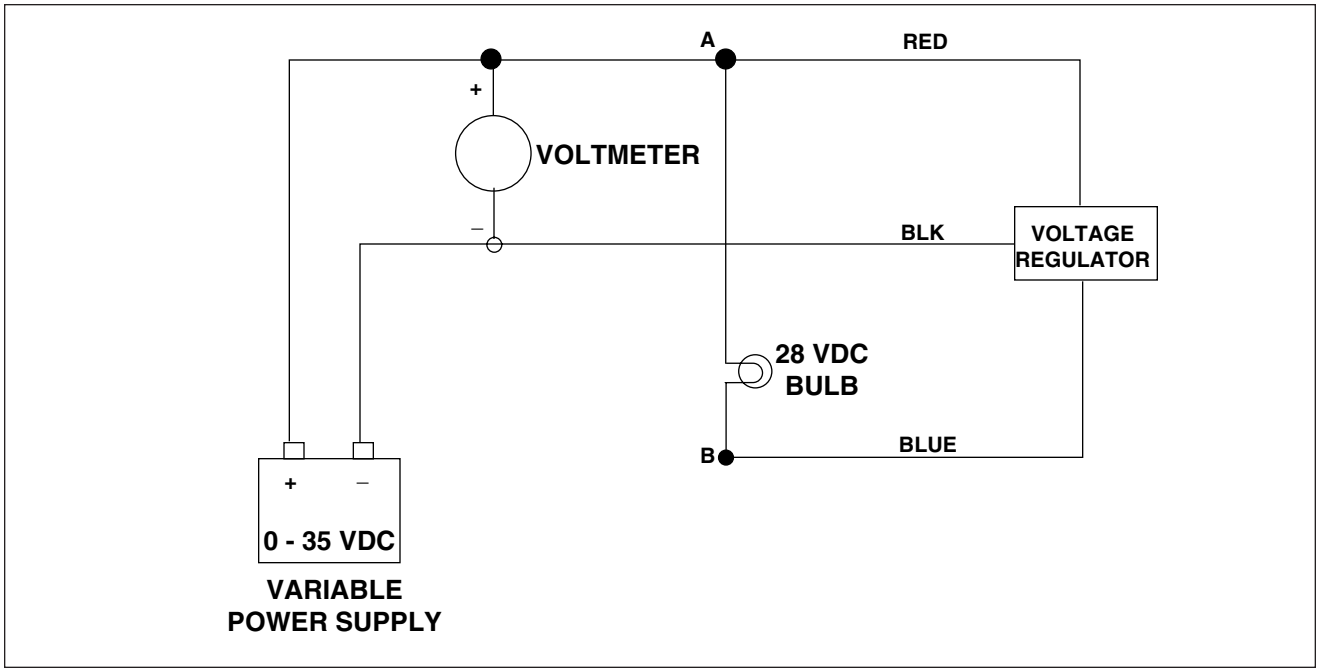


Figure 24-60. 28 Vdc System Lamar Overvoltage Check

GRIDS 1L18 AND 1L19
INTENTIONALLY LEFT BLANK

EXTERNAL POWER

External Power Receptacle Operation

The external power receptacle is on the right side of fuselage aft of wing. Be sure the external power being used delivers the appropriate voltage, i. e., 12 Vdc for the Archer II and 24 Vdc for the Archer III. Damage to electrical equipment will result if a 28 Vdc external power supply is attached to the Archer II's 12 Vdc system.Use external power for starting or equipment operation as follows:

— WARNING —

Do not fly aircraft if there is no indication of alternator output.

— CAUTION —

Charging current is high if battery is weak. Do not take off until charging current is below 20 amperes. Do not take off with a completely discharged battery. Three volts are required to start alternator.

1. Turn aircraft master switch to OFF. Turn off all electrical equipment.
2. Insert jumper cable plug into fuselage socket.

— CAUTION —

If using a Piper External Power Kit (applicable to Archer II only), check RED lead jumper cable is connected to the POSITIVE (+) terminal of the external 12 volt battery, connect BLACK lead to NEGATIVE terminal.

3. Continue normal engine starting technique.
4. Remove jumper cable plug.
5. Turn master and alternator switches to ON position and check alternator ammeter for output.
   a. On Archer II (S/N' 28-7690001 thru 28-8190264), the split master (BAT) and alternator (ALT) switches are interlocked. When BAT switch is positioned ON the ALT switch is also positioned on.
   b. On Archer II (S/N' 28-8190265 thru 28-8690056 and 2890001 thru 2890205), the split master (BAT) and alternator (ALT) switches are ***not*** interlocked, and may be operated independently of each other. Therefore, both halves of the switch must be positioned on.
   c. On the Archer III (S/N's 2890206 and up), the master (BATT MASTR) and alternator (ALT) switches are independent rocker type switches located in the overhead switch panel. Both must be positioned ON.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

ELECTRICAL SYSTEM LOAD DISTRIBUTION

1. Archer II

CHART 2413. ELECTRICAL SYSTEM COMPONENT LOADS

DUTY CYCLE CONT.	DUTY CYCLE INTER.	EQUIPMENT	CIRCUIT BREAKER	LOAD (AMPS)	OPTIONAL
X		Anti-Collision Light			
		Grimes 40-0101-XX-12	10	3.5	
		Whelen WRML-12	10	3.5	
		Whelen White Strobe	10	3.8	X
X		Position Lights	7	5.4	
	X	Landing Lights	10	8.0	
X		Instrument Light(s)	5	(max)	
		Red Flood	5	1.0	
		Panel	5	2.4	
	X	Reading Light			
		Dome	5	0.6	
	X	Fuel Pump			
		Pulsating (Carb)	10	0.5	
X		Engine Gauges	5	approx 1.0	
X		Elec Turn & Bank	5	0.5	
X		Pitot Heat	15	13.2	
	X	Cigar Lighter		8.0	
X		Master Solenoid	—	0.8	
	X	Starter Solenoid	15	10.0	
		Avionics (see Mfg's Installation Manual)			

THIS SPACE INTENTIONALLY LEFT BLANK

2. Archer III (S/N's 2890206 and up)

CHART 2414. ELECTRICAL SYSTEM COMPONENT LOADS

DUTY CYCLE CONT.	DUTY CYCLE INTER.	EQUIPMENT	CIRCUIT BREAKER	LOAD (AMPS)
X		Anti-Collision Light		
		Whelen White Strobe	5	3.8
X		Position Lights	5	4.0
	X	Landing/Taxi Lights	10	7.0
X		Instrument Light(s)		
		Flood (2)	5	0.6
		Panel	7.5	0.7
		Switch	—	1.3
	X	Reading Lights	5	0.3
	X	Fuel Pump		
		Pulsating (Carb)	5	3.0
X		Engine Gauges	3	approx 0.2
X		Elec Turn & Bank	5	0.3
X		Pitot Heat	7.5	6.0
	X	Cigar Lighter		4.0
X		Master Solenoid	—	0.5
	X	Starter Solenoid	10	7.0
		Avionics (see Mfg's Installation Manual)		

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

AIRPLANE

MAINTENANCE MANUAL

CARD 2 OF 4

PA-28-181
ARCHER II
ARCHER III

PIPER AIRCRAFT CORPORATION

(PART NUMBER 761 679 **July 30, 1994**

2A1

Island Enterprises

Published by
Technical Publications

Piper Aircraft Corporation
2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member of GAMA
General Aviation
Manufacturers Association

2A2

Island Enterprises

INTRODUCTION

AEROFICHE EXPLANATION AND REVISION STATUS

The Maintenance Manual information incorporated in this set of Aerofiche cards has been arranged in accordance with the general specifications of Aerofiche adopted by the General Aircraft Manufacturer's Association (GAMA).

Conversion of Aerofiche alpha/numeric code numbers:
First number is the Aerofiche card number.
Letter is the horizontal line reference per card.
Second number is the vertical line reference per card.
Example: 2J16 = Aerofiche ,card number two of given set, Grid location J16.

The following is provided to aid in locating the various chapters and related service information desired.

1. A complete manual System/Chapter Index Guide is given at Grids A8 thru A9 of all fiche in this set.
2. A complete list of Illustrations is given at Grids A10 thru A14 of all fiche in this set.
3. A complete list of Charts is given at Grids A15 and A16 of all fiche in this set:
4. A complete list of paragraph titles and appropriate Grid location numbers is given at the beginning of each Chapter relating to the information within that Chapter.
5. Identification of Revised Material.

   Revised text and illustrations are indicated by a black vertical line along the left hand margin of the frame, opposite revised, added or deleted material. Revision lines indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation, indexing, the physical location of material or complete page additions are not identified by revision lines.
6. Revisions to this Maintenance Manual 761 679, issued August 16, 1978, are as follows:

Revisions	Date	Aerofiche Card Effectivity
ORG780816	August 16,1978	—
CR870801	September 16, 1987	1, 2 and 3
CR940731	July 31. 1994	1, 2, 3 and 4

The date on Aerofiche cards should not be earlier than the date noted for the respective card effectivity. Consult the latest Aerofiche card in this series for current Aerofiche card effectivity.

VENDOR PUBLICATIONS.

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

ENGINE:

Overhaul Manual = AVCO LYCOMING - OVERHAUL MANUAL
DIRECT DRIVE ENGINE - P/N 60294-7
Avco Lycoming Division
Williamsport, PA 17701

Parts Catalog = AVCO LYCOMING - P/N PC-102
Avco Lycoming Division
Williamsport, PA 17701

Operators Handbook = AVCO LYCOMING O-360
SERIES AIRCRAFT ENGINES - P/N 60297-9
Avco Lycoming Division
Williamsport, PA 17701

PROPELLER:

Repair Manual = METAL PROPELLER REPAIR MANUAL
Sensenich Corporation
P.O. Box 1168, Lancaster, PA 17604

MAGNETOS:

Service Manual = SLICK-AIRCRAFT MAGNETOS
Catalog and Service Manual
SLICK ELECTRO Inc
Rockford, IL 61101

WHEEL AND STRUT FAIRINGS:

Repair Manual = A.B.S. THERMOPLASTIC LANDING GEAR
WHEEL AND STRUT FAIRING REPAIR
INSTRUCTION MANUAL - P/N 761 708
Vero Beach Service Sales Department
Piper Aircraft Corporation
Vero Beach, Florida 32960

DRY AIR PUMPS:

Service Information = AIRBORNE DIVISION
AIR AND FUEL PRODUCTS
Parker Hannifin Corporation
711 Taylor St.
Elyria, OH 44036

AUTO FLIGHT:

SEE CHAPTER 22 AUTO FLIGHT

SERIAL NUMBER INFORMATION

PA-28-181, ARCHER II - 1976
Serial Numbers 28-7690001 to 28-7690479 inclusive
PA-28-181, ARCHER II - 1977
Serial Numbers 28-7790001 to 28-7790607 inclusive
PA-28-181, ARCHER II -1978
Serial Numbers 28-7890001 to 28-7890564 inclusive
PA-28-181, ARCHER II - 1979
Serial Numbers 28-7990001 to 28-7990626 inclusive
PA-28-181, ARCHER II - 1980
Serial Numbers 28-8090001 to 28-8090382 inclusive
PA-28-181, ARCHER II - 1981
Serial Numbers 28-8190001 to 28-8190336 inclusive
PA-28-181, ARCHER II - 1982
Serial Numbers 28-8290001 to 28-8290188 inclusive
PA-28-181, ARCHER II - 1983
Serial Numbers 28-8390001 to 28-8390090 inclusive
PA-28-181, ARCHER II - 1984
Serial Numbers 28-8490001 to 28-8490112 inclusive
PA-28-181, ARCHER II - 1985
Serial Numbers 28-8590001 to 28-8590092 inclusive
PA-28-181, ARCHER II - 1986
Serial Numbers 28-8690001 to 28-8690056 inclusive
Serial Numbers 2890001 to 2890205*
PA-28-181, ARCHER III
Serial Numbers 2890206 and up

*New method of assigning serial numbers used.

GAMA SYSTEM/CHAPTER INDEX GUIDE

SYST CHAP	SUB-SYST SECTION TITLE	AEROFICHE GRID NO.
4	AIRWORTHINESS	1A17
5	TIME LIMITS/MAINT CHECKS	1A21
6	DIMENSIONS AND AREAS	1B15
7	LIFTING AND SHORING	1C4
8	LEVELING AND WEIGHING	1C9
9	TOWING AND TAXIING	1C14
10	PARKING AND MOORING	1C18
11	PLACARDS AND MARKINGS	1C22
12	SERVICING	1D9
20	STANDARD PRACT - AIRFRAME	1E19
21	ENVIRONMENTAL SYSTEM	1F18
22	AUTOFLIGHT	1I6
23	COMMUNICATIONS	1I11
24	ELECTRICAL POWER	1J3
25	EQUIPMENT/FURNISHINGS	2A17
27	FLIGHT CONTROLS	2A24
28	FUEL	2D10
32	LANDING GEAR	2E16
33	LIGHTS	2G8
34	NAVIGATION & PITOT/STATIC	2H14

GAMA SYSTEM/CHAPTER INDEX GUIDE (CONTD)

SYST CHAP	SUB-SYST SECTIONTITLE	AEROFICHE GRID NO.
37	VACUUM SYSTEM	2I13
39	ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS	2J9
51	STRUCTURES	2J19
52	DOORS	2K18
55	STABILIZERS	2L7
56	WINDOWS	3A17
57	WINGS	3B3
61	PROPELLER	3B24
70	STANDARD PRACTICES - ENGINE	3C10
71	POWER PLANT	3C15
73	ENGINE FUEL SYSTEM	3D24
74	IGNITION	3E16
77	ENGINE INDICATING	3G7
78	EXHAUST	3G16
79	OIL SYSTEM	3G23
80	STARTING	3H10
91	CHARTS AND WIRING DIAGRAMS	3I4
91	CHARTS AND WIRING DIAGRAMS (CONT.)	4A17

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
6-1.	Three View - Archer II	1B20
6-2.	Three View - Archer III	1B21
6-3.	Station References - Archer II	1B22
6-4.	Station References - Archer III	1B24
6-5.	Access Plates and Panels	1B20
7-1.	Jacking Arrangement	1C7
8-1.	Leveling Longitudinally	1C11
8-2.	Leveling Laterally	1C11
8-3.	Weighing Airplane	1C12
11-1.	External Placards and Decals - Archer II	1C24
11-2	External Placards and Decals - Archer III	1D1
11-3	Internal Placards and Decals - Archer II	1D3
11-4	Internal Placards and Decals - Archer III	1D5
12-1.	Fuel Filter Bowl and Screen	1D14
12-2.	Servicing Points	1D19
12-3.	Main Gear Oleo Struts (cut-away view)	1D22
12-4.	Tire Balancer Fixture	1D24
12-5.	Lubrication Chart (Landing Gear, Main)	1E8
12-6.	Lubrication Chart (Landing Gear, Nose)	1E9
12-7.	Lubrication Chart (Control System)	1E10 thru 1E13
12-8.	Lubrication Chart (Cabin Door, Baggage Door and Seat)	1E14
12-9.	Lubrication Chart (Power Plant and Control Pivot Points)	1E15
12-10.	Lubrication Chart (Air Conditioning Condenser)	1E16
20-1.	Torque Wrench Formula	1E22
20-2.	Installing Rod End Bearings	1E23
20-3.	Cherrylock Rivet Removal	1E24
20-4.	Hose and Line Markings	1F1
20-5.	Flareless Tube Fittings	1F2
21-1.	Cabin Heater, Defroster, and Fresh Air System (Archer II)	1F23
21-2.	Overhead Vent System (not available with air conditioning) (Archer II)	1F24
21-3.	Cabin Heater, Defroster, and Fresh Air System (Archer III)	1G1
21-4.	Overhead Vent System (Archer III)	1G2
21-5.	Air Conditioning System Installation (Typical)	1G11
21-6.	Service Valves - Archer II (Sheet 1 of 2)	1G17
21-6.	Service Valves - Archer III (Sheet 2 of 2)	1G17
21-7.	Test Manifold and Charging Cart	1G18
21-8.	Manifold Set Operation	1G18
21-9.	Manifold to Recharging/Test Stand Hookup	1G19
21-10	Robinair 34700 Control Panel and Hose Connections	1G20
21-11	Robinair 34700 Hose Hookup	1G21
21-12	Compressor and Fabricated Oil Dipstick	1H6

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
21-13.	Compressor and Alternator Belt Installation (Sheet 1 of 2)	1H8
21-13.	Compressor and Alternator Belt Installation (Sheet 2 of 2)	1H9
21-14.	Magnetic Clutch	1H11
21-15.	Condenser Air Scoop Installation	1H14
21-16.	Expansion Valve	1H15
21-17.	Components Installation	1H17
21-18.	Air Conditioning Wiring Schematic (typical) - Archer II Sheet 1 of 2	1H19
21-18.	Air Conditioning Wiring Schematic (typical) - Archer III Sheet 2 of 2	1H20
23-1.	Two Year, Magnesium Battery Connections	1I15
23-2.	Communications Components Corporation ELT Schematic	1I16
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 1 of 2) (S/N's 28-7990457 thru 28-8690056 and 2890001 thru 2890065)	1I17
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 2 of 2) (S/N's 2890066 thru 2890139)	1I17
23-4.	ELT Portable Folding Antenna (Narco)	1I18
23-5.	ELT Using Fixed Aircraft Antenna (Narco)	1I18
23-6.	Narco ELT 910 Emergency Locator Transmitter Schematic	1I20
23-7.	ELT 910 Battery Pack	1I21
23-8	Artex 110 E. L. T.	1I22
23-9	Artex E. L. T. 110 Wiring Schematic	1I23
24-1.	Exploded View of Prestolite Alternator	1J16
24-2.	Lamp-Bank Load	1J16
24-3.	Removal of Slip Ring End Bearing (Prestolite Alternator)	1J20
24-4.	Removal of Rectifier (Prestolite Alternator)	1J20
24-5.	Removal of Drive End Head (Prestolite Alternator)	1J20
24-6.	Removal of End Head Bearing (Prestolite Alternator)	1J20
24-7.	Testing Rotor for Ground (Prestolite Alternator)	1J22
24-8.	Testing Rotor for Shorts (Prestolite Alternator)	1J22
24-9.	Installation of Bearing (Prestolite Alternator)	1J22
24-10.	Installation of Rectifier (Prestolite Alternator)	1J22
24-11.	Terminal Assembly (Prestolite Alternator)	1J24
24-12.	Slip Ring End Bearing Assembly (Prestolite Alternator)	1J24
24-13.	Testing Prestolite Alternator	1J24
24-14.	Prestolite Brush Installation	1J24
24-15.	Prestolite Alternator Internal Wiring Diagram	1K2
24-16.	Exploded View of Chrysler Alternator	1K3

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-17.	Checking Chrysler Alternator Field Coil Current Draw	1K5
24-18.	Testing Chrysler Alternator Field Circuit	1K6
24-19.	Chrysler Alternator Rectifier End Shield and Stator Assembly	1K7
24-20.	Testing Chrysler Alternator Positive Rectifiers with C3829 Tester	1K8
24-21.	Testing Chrysler Alternator Negative Rectifiers with C-3829 Tester	1K8
24-22.	Testing Chrysler Alternator Positive Rectifiers with Test Lamp	1K9
24-23.	Testing Chrysler Alternator Negative Rectifiers with Test Lamp	1K9
24-24.	Chrysler Alternator Rectifier and Heatsink Assembly Removal	1K10
24-25.	Chrysler Alternator Rectifier End Shield Assembly	1K10
24-26.	Testing Chrysler Alternator Stator	1K11
24-27.	Removal of Chrysler Alternator Pulley	1K11
24-28.	Removal of Chrysler Alternator Bearing	1K11
24-29.	Removal of Chrysler Alternator Rectifier End Shield Bearing	1K11
24-30.	Testing Chrysler Alternator Rotor for Ground	1K12
24-31.	Testing Chrysler Alternator Rotor for Opens or Shorts	1K12
24-32.	Installation of Chrysler Alternator Grease Retainer	1K13
24-33.	Installation of Chrysler Alternator Rectifier End Shield Bearing	1K13
24-34.	Installation of Chrysler Alternator Drive End Shield Bearing	1K14
24-35.	Installation of Chrysler Alternator Pulley	1K14
24-36.	Installation of Chrysler Alternator Insulators	1K14
24-37.	Installation of Chrysler Alternator Positive Rectifier Assembly	1K14
24-38.	Installation of Chrysler Alternator Capacitor	1K5
24-39.	Installation of Chrysler Alternator Battery Output Insulator	1K15
24-40.	Installation of Chrysler Alternator Negative Rectifier Assembly	1K16
24-41.	Installation of Chrysler Alternator Stator	1K16
24-42	Exploded View of Electrosystems Alternator	1K18
24-43	Eight Resistor-Bank Load	1K19
24-44.	Removal of Slip Ring End Bearing (Electrosystems Alternator)	1K21
24-45.	Removal of Rectifier (Electrosystems Alternator)	1K21
24-46.	Removal of Drive End Head (Electrosystems Alternator)	1K22
24-47.	Removal of End Head Bearing (Electrosystems Alternator)	1K22

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-48.	Testing Rotor for Ground (Electrosystems Alternator)	1K23
24-49.	Testing Rotor for Shorts (Electrosystems Alternator)	1K23
24-50.	Installation of Bearing (Electrosystems Alternator)	1K23
24-51.	Installation of Rectifier (Electrosystems Alternator)	1K23
24-52.	Terminal Assembly (Electrosystems Alternator)	1L1
24-53.	Slip Ring End Bearing Assembly (Electrosystems Alternator)	1L1
24-54.	Testing Electrosystems Alternator	1L1
24-55.	Electrosystems Alternator Brush Installation	1L2
24-56.	Electrosystems Alternator Internal Wiring Diagram	1L3
24-57.	Lamar Regulator Check	1L15
24-58.	Lamar Overvoltage Check	1L15
25-1.	Seat Back Lock	2A19
25-2.	Lunbar Seat Bladder Installation	2A21
27-1.	Rod End Installation Method	2B5
27-2.	Control Cable Inspection Technique	2B5
27-3.	Cable Wear Patterns	2B6
27-4.	Internal Cable Wear	2B7
27-5.	Pulley Wear Patterns	2B9
27-6.	Control Column Assembly	2B13
27-7.	Flex (Universal) Joint Assembly	2B15
27-8.	Aileron Controls (typical)	2B17
27-9.	Aileron Rigging Tool	2B20
27-10.	Fabricated Aileron and Flap Rigging Tool	2B20
27-11.	Bellcrank Rigging Tool	2B22
27-12.	Aileron Rigging	2B23
27-13.	Rudder and Steering Pedal Assembly	2C3
27-14.	Rudder Controls	2C5
27-15.	Rudder Rigging Tool	2C7
27-16.	Clamping Rudder Pedals	2C7
27-17.	Rudder Rigging	2C8
27-18.	Fabricated Rudder Rigging Tool	2C8
27-19.	Rudder Travel Adjustments	2C9
27-20.	Rudder Trim Control	2C10
27-21.	Stabilator Controls	2C16
27-22.	Stabilator Rigging Tool	2C17
27-23.	Fabricated Stabilator Rigging Tool	2C18
27-24.	Stabilator and Trim Travel Adjustments	2C18
27-25.	Stabilator Trim Control (Floor Control)	2C20
27-26.	Methods of Securing Trim Cables	2C21
27-27.	Flap Controls	2D3
27-28.	Flap Stop Adjustment	2D5
27-29.	Flap Rigging Tool	2D5
27-30.	Flap Rigging	2D7

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
28-1.	Archer II Fuel System Diagram	2D14
28-2.	Archer III Fuel System Diagram (S/N's 2890006 and up)	2D15
28-3.	Locking Gas Cap	2D20
28-4.	Fuel Filter Bowl and Screen	2D23
28-5.	Plunger Fuel Pump	2D24
28-6.	Tolerances, Union Nut,and Tubing Nut	2E3
28-7.	Resistance Decade Test Box Set Up	2E9
28-8	Archer III Fuel Quantity Needle Deviation	2E10
28-9.	Fuel Quantity Transmitter Checking Jig	2E12
28-10	Fabricated Fuel Quantity Transmitter Checking Jig	2E13
32-1.	Main Gear Oleo Strut Assembly	2F1
32-2.	Orifice Replacement Tool	2F2
32-3.	Main Gear Installation	2F4
32-4.	Nose Gear Oleo Strut Assembly	2F8
32-5.	Retainer Ring Tool	2F10
32-6.	Nose Gear Installation	2F11
32-7.	Clamping Rudder Pedals in Neutral Position	2F14
32-8	Rudder Pedals at Neutral Angle	2F14
32-9.	Main Wheel Assembly	2F16
32-10.	Nose Wheel Assembly	2F18
32-11.	Brake Assembly	2F19
32-12.	Removal and Installation of Anchor Bolts	2F20
32-13.	Disc Brake Minimum Thickness	2F22
32-14.	Brake System Installations	2F22
32-15.	Brake Master Cylinder (Hand/Parking Brake)	2F23
32-16.	Toe Brake Installation	2G1
32-17.	Brake Cylinder 10-27, 10-30, and 17000 (Toe Brake)	2G2
33-1.	Archer II Annunciator Panel	2G21
33-2.	Archer III Annunciator Panel and Box Assembly	2G22
33-3	Archer II Strobe Light Connections	2H3
33-4	Archer III Landing Light Installation	2H6
33-5	Archer III Landing Light Adjustment	2H7
33-6	Archer III Strobe Light Connections	2H10
34-1.	Pitot/Static System	2H19
37-1.	Archer II Auxiliary Vacuum Pump Installation	2J1
37-2	Archer III Auxiliary Vacuum Pump Installation	2J2
37-3	Archer II and III Auxiliary Vacuum Electrical Schematic	2J3
51-1.	Skin Materials and Thickness	2K2
51-2	Baggage Compartment Inspection Holes Cutout Details	2K4
51-3.	Surface Scratches, Abrasions, or Ground-in-Dirt	2K8
51-4.	Deep Scratches, Shallow Nicks, and Small Holes	2K9
51-5.	Mixing of Epoxy Patching Compound	2K9
51-6.	Welding Repair Method	2K11
51-7.	Repairing of Cracks	2K11

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
51-8.	Various Repairs	2K12
51-9.	Repair of Stress Lines	2K13
51-10.	Repair of Impacted Damage	2K13
52-1.	Installation of Door Snubber	2L1
52-2.	Fabricated Tool for Baggage Door Lock	2L5
55-1.	Empennage Group Installation	2L12
55-2.	Methods of Securing Control Cables	2L13
55-3.	Stabilator Balance	2L13
55-4.	Control Surface Balancing Tool	2L14
55-5.	Rudder Balance	2L20
56-1.	Windshield Installation - Typical	3A22
56-2.	Single Pane Side Window Installation, - Typical	3A24
57-1.	Installation of Stall Strips	3B8
57-2.	Wing Installation	3B11
57-3.	Aileron and Flap Installation	3B19
57-4.	Aileron Balance Configuration	3B21
61-1.	Typical Nicks and Removal Method	3C4
61-2.	Archer II Propeller Installation	3C6
61-3.	Archer III Propeller Installation	3C7
71-1.	Static Rpm (Sea Level ± 500 Feet Pressure Altitude Only)	3D4
71-2.	Change in Static Rpm Vs. Engine Oil Temperature	3D5
71-3.	Psychromatic Chart	3D6
71-4.	Archer II Engine Installation	3D9
71-5.	Archer III Engine Installation	3D10
71-6.	Archer II Cowling	3D15
71-7.	Archer III Cowling (S/N’s 2890206 and up)	3D15
71-8.	Ice Detection System	3D22
73-1.	Carburetor	3E5
73-2.	Archer II Engine Primer	3E6
74-3.	Archer III Fuel Primer System	3E7
73-4.	Adjustment of Engine Controls	3E10
73-5	Archer III Instrument Cluster - Fuel Pressure Gauge	3E14
74-1.	T-100 Assembly and Timing Tool Kit	3E23
74-2.	Removing Coil Wedges	3F2
74-3.	Exploded View of 4200 Series Magneto	3F3
74-4.	Index Plate and Timing Plug	3F5
74-5.	Installation of Bearings and Bearing Plate	3F5
74-6.	Magneto Oil Seal Installation on T-100	3F7
74-7.	Magneto Internal Timing	3F7
74-8.	Bendix Magneto Inspection	3F9
74-9.	Contact Spring Inspection	3F10
74-10.	Impulse Coupling	3F10
74-11.	Magneto Timing Marks	3F12
74-12.	Timing Pointer	3F12

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
74-13.	Timing Kit Installed	3F12
74-14.	Breaker Compartment With Cast Timing Marks	3F12
74-15.	Stripping Tool	3F18
74-16.	Inserting Stripping Tool	3F18
74-17.	Cutting Insulation	3F18
74-18.	Removing Silicone Rubber From Wire	3F18
74-19.	Installation of Plug End Nut	3F19
74-20.	Flaring Out the Shielding	3F19
74-21.	Installation of Ferrule	3F19
74-22.	Driving Tool	3F19
74-23.	Installation in Housing	3F21
74-24.	Securing Wire in Housing	3F21
74-25.	Installation of Electrical Screw	3F21
74-26.	Installation of Insulation Sleeve	3F21
74-27.	Installation of Spring	3F22
74-28.	Removing Spark Plug Frozen to Bushing	3F22
74-29.	Archer II Ignition Switch Installation	3G2
74-30.	Archer III Starter Switch Installation	3G2
74-31.	Archer III Magneto Switch(es) Installation	3G3
77-1.	Exhaust Gas Temperature Probe Installation	3G14
78-1.	Archer II Exhaust System Inspection Points	3G20
78-2	Archer III Exhaust System Inspection Points	3G20
80-1.	Exploded View of Gear Reduction Starting Motor	3H14
80-2.	Turning Starting Motor Commutator	3H19
80-3.	Testing Motor Armature for Shorts	3H19
80-4.	Testing Motor Fields for Grounds	3H20
80-5.	No-Load Test Hookup	3H22
80-6.	Stall-Torque Hookup	3H22

Refer to Electrical Schematic Table of Contents 4A18

LIST OF CHARTS

FIGURE NO.	SUBJECT	GRID NO.
601	Leading Particulars and Principal Dimensions	1B18
1201	Thread Lubricants	1E5
1202	Type of Lubricants	1E6
2001	Maximum Distance Between Supports for Fluid Tubing	1F3
2002	Types of Metal Corrosion	1F9
2101	Troubleshooting Air Conditioner	1G5
2102	Troubleshooting Air Conditioning System	1G7
2103	Refrigerant Temperature Pressure	1G13
2104	Aluminum Tubing Torque (Archer II)	1G16
2105	Recommended Torque Specifications (Archer III)	1G16
2106	System Vacuum	1G19
2107	Compressor Oil Charge	1H7
2108	Compressor Misalignment and Idler Pulley Nominal Location	1H7
2109	Blower System Wire Color Codes	1I3
2401	Troubleshooting Alternator	1J9
2402	Troubleshooting (Battery)	1J13
2403	Prestolite Alternator Specifications	1K1
2404	Chrysler Alternator Specifications	1K17
2405	Electrosystems Alternator Specifications	1L3
2406	Alternator Belt Tension	1L4
2407	Hydrometer Reading and Battery Charge Percent Archer II, 12 Volt System	1L6
2408	Hydrometer Reading and Battery Charge Percent Archer III, 24 Volt System	1L10
2409	Electrolytic Temperature Corrections	1L10
2410	Specific Gravity Temperature Correction	1L11
2411	Discharge Rate	1L11
2412	Electrolyte Freezing Point	1L12
2413	(Archer II) Electrical System Component Loads	1L22
2414	(Archer III) Electrical System Component Loads	1L23
2701	Cable Tension Vs. Ambient Temperature	2B4
2702	Troubleshooting Aileron Control System	2B11
2703	Troubleshooting Rudder Control System	2C1
2704	Troubleshooting Rudder Trim Control System	2C2
2705	Troubleshooting Stabilator Control System	2C13
2706	Troubleshooting Stabilator Manual Trim Control	2C14
2707	Troubleshooting Flap Control System	2D2
2801	Troubleshooting (Fuel System)	2D16
2802	Transmitter/Fuel Gauge Tolerances	2E7
2803	Fuel Quantity Gauge Resistance/Tolerances Values	2E7
2804	14 Vdc Fuel Quantity Gauge Tolerance Values	2E8
2805	28 Vdc Fuel Quantity Gauge Resistance/Tolerance Values	2E9
2806	28 Vdc Fuel Quantity Gauge Tolerance Values	2E10
2807	Fuel Quantity Transmitter Calibration Tolerances	2E11
2808	Troubleshooting Fuel Quantity Indicator	2E14
3201	Troubleshooting (Landing Gear)	2E20

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
3202	Nose Gear Alignment Tolerances	2F13
3301	Archer III Annunciator Panel Function Description	2G15
3302	Troubleshooting Archer II Annunciator Panel	2G16
3303	Troubleshooting Archer III Annunciator Panel	2G18
3401	Troubleshooting Vertical Speed Indicator	2H21
3402	Troubleshooting Altimeter	2H22
3403	Troubleshooting Pitot/Static Tubes and Airspeed Indicator)	2H23
3404	Troubleshooting Attitude Deviation Indicator	2I4
3405	Troubleshooting Heading (Directional Gyro) Indicator	2I7
3406	Troubleshooting (Magnetic Compass)	2I8
3407	Troubleshooting Turn Indicator	2I10
3701	Troubleshooting Vacuum System	2I16
5101	List of Materials For Thermoplastic Repair	2K7
6101	Archer II Propeller Torque Limits	3C5
7101	Engine Fault Isolation	3C19
7102	Propeller Applicability	3D2
7103	Static Rpm With 76EM8S5-0-62 or 76EM8S14-0-62 Propellers	3D7
7301	Troubleshooting Fuel Pressure Gauge	3E12
7302	Archer III Instrument Calibration Chart	3E13
7401	Troubleshooting Archer II Magnetos	3E19
7701	Troubleshooting (Tachometer)	3G11
7702	Troubleshooting (Exhaust Gas Temperature Gauge) (Alcor)	3C24
7901	Troubleshooting Archer II Engine Oil Pressure Gauge	3H6
7902	Troubleshooting Archer II Engine Oil Temperature Gauge	3H6
7903	Troubleshooting Archer III Engine Oil Pressure Gauge	3H7
7904	Troubleshooting Archer IIi Engine Oil Temperature Gauge	3H8
8001	Troubleshooting (Starter)	3H14
8002	Starting Motor Specifications	3H23
9101	Flare Fitting Torques	3I7
9102	Recommended Nut Torques	3I8
9103	Decimal Conversions	3I10
9104	Torque Conversion Tables	3I11
9105	Conversion Table Notes	3I12
9106	Metric Conversion Tables	3I13
9107	Decimal/Millimeters Equivalents of Drill Sizes	3I6
9108	Ball Diameters For Testing Hose Restrictions	3I8
9109	Hose Specifications	3I9
9110	List of Consumable Materials	3I20
9111	Vender Information	3J4
9112	Electrical Wire Coding	3J7
9113	Electrical Symbols	3J8

CHAPTER

25

EQUIPMENT/FURNISHING

2A17

CHAPTER 25 - EQUIPMENT/FURNISHINGS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
25-10-00	FLlGHT COMPARTMENT	2A19	
25-10-00	Rigging lnstructions - Seat Back Lock and Release	2A19	
25-10-00	Lumbar Seats		
25-10-00	Description	2A19	
25-10-00	Removal of Lumbar Bladder	2A19	
25-10-00	Instalation of Lumbar Bladder	2A20	
25-10-00	Shoulder Harness lnertia Reel Adjustment	2A22	

FLIGHT COMPARTMENT

A. RIGGING INSTRUCTIONS - SEAT BACK LOCK AND RELEASE (Refer to figure 25-1.)

1. Loosen screws and loosen clamps to allow push-pull cable to move within the clamps.
2. Place a straightedge along lower surface of seat back release bushing.
3. Adjust push-pull cable by raising or lowering until lower surface of the stop assembly is parallel to straightedge.
4. Secure push-pull cable in position by tightening screws on clamps. The stop must be lubricated and free to swivel without excessive play.
5. Push on seat back to check stop assembly engagement. Rotate seat back release handle and check for seat back disengagement.

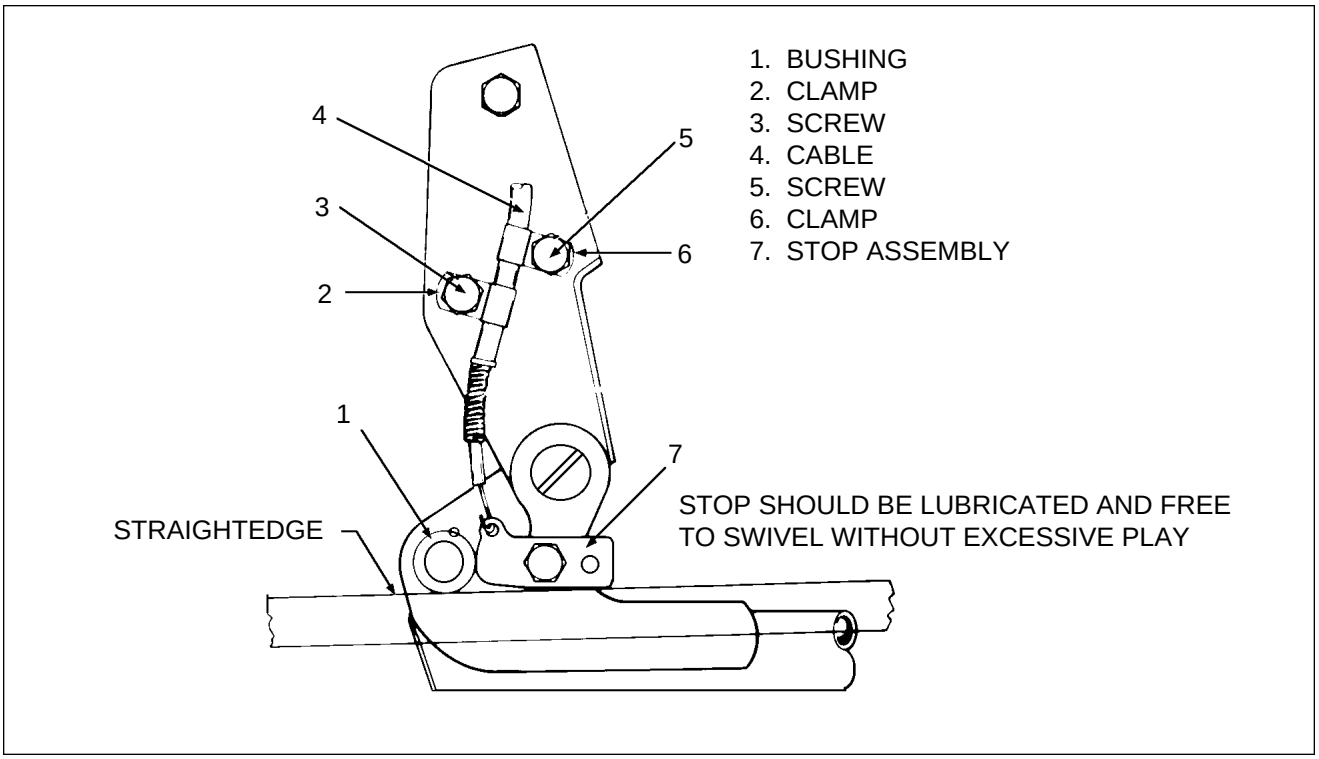


Figure 25-1. Seat Back Lock

B. LUMBAR SEATS (Refer to Figure 25-2.)

1. Description

Lumbar pilot and co-pilot seat installations are available on the Archer II as an option. Lumbar seats are installed in the Archer III (S/N's 2890206 and up) as standard equipment. The installation consists of an inflatable bladder attached to the seat back filler and a inflation bulb located under and on the inboard side of each pilot and co-pilot seat.

2. Removal Of Lumbar Bladder

To remove the lumbar bladder for repair or replacement:

a. Remove seat from airplane.

b. Loosen velcro securing seat back filler cover.
c. Remove only enough of seat back filer cover to expose lumbar bladder.

— NOTE —

Inflation tube may be removed before or after bladder is removed from seat back filler. Tube is not glued to nipple attachment; it can be removed by carefully pulling on tube.

d. Remove inflation tube from bladder.

— CAUTION —

Do not use a chemical solvent to remove bladder. Solvent may damage seat back filler

— CAUTION —

To avoid or minimize damage to seat back filler during removal, use one hand to retain seat back filler in place, while gently removing bladder with other hand.

e. Starting at either right or left edge of bladder, carefully and slowly pull bladder and pad assembly from seat back filler.

3. Installation Of Lumbar Bladder

— NOTE —

An installation kit is required for airplanes not previously equipped with a lumbar support Refer to Piper's Illustrated Parts Catalog for kit part number.

a. If necessary to assemble pad and bladder:
   (1) Apply a layer of 3M 847 cement to smooth side of bladder pad.
   (2) Apply a layer of 3M 847 cement to back side of bladder (side away from inflation tube nipple).
   (3) Attach bladder pad to bladder.

— NOTE —

While cement does not set immediately, there is no need to wait before attaching bladder and pad to seat back filler.

b. Apply a layer of 3m 847 cement to rough side of bladder pad.
c. Apply a layer of 3m 847 cement to seat back filler where bladder is to be located.
d. Attach bladder and pad assembly to seat back filler. Depending on temperature and humidity, allow 0:30 minutes to 1:00 hour for cement to set.
e. Install seat back filler cover and secure velcro fastenings.
f. Install seat in airplane.

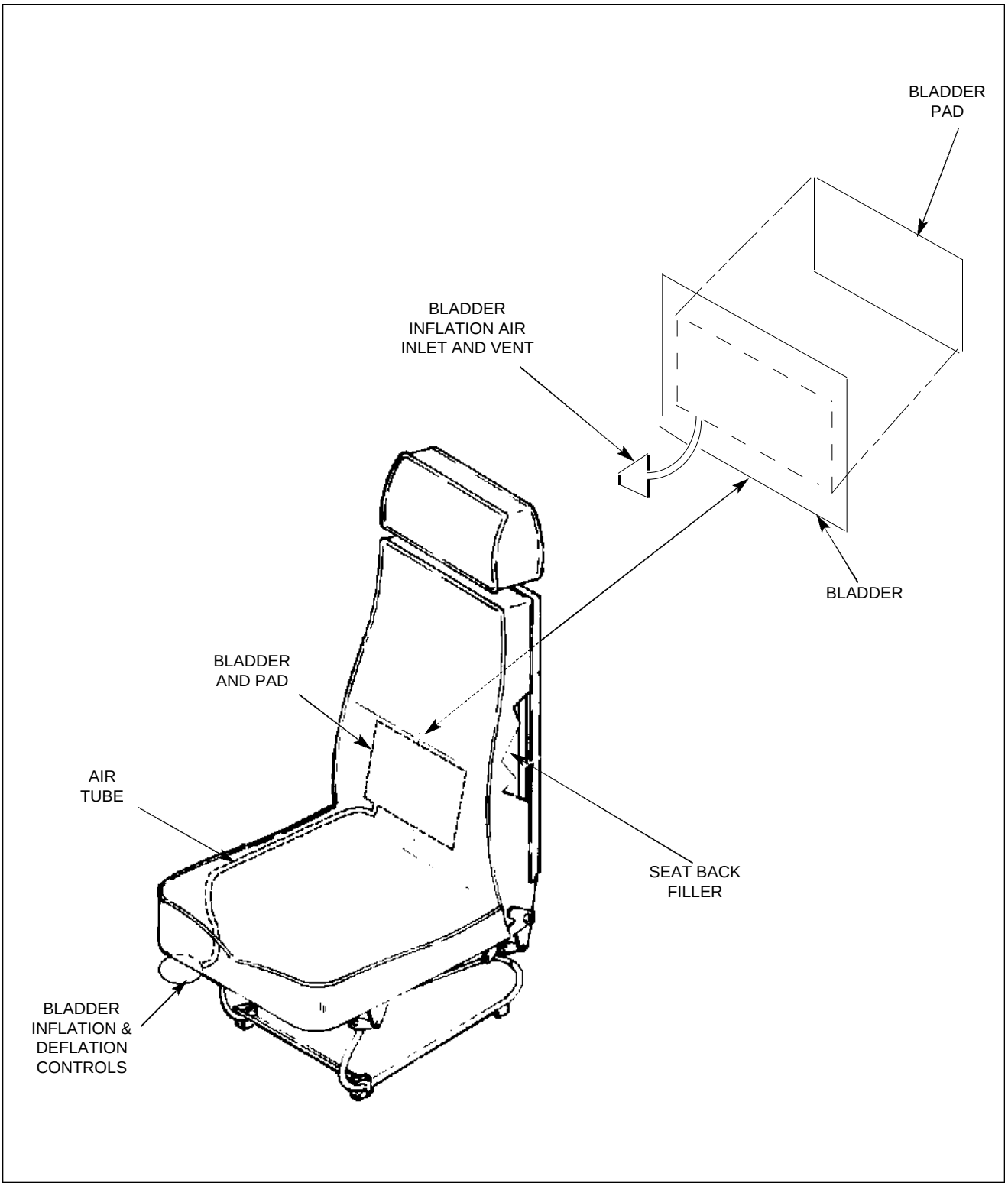


Figure 25-2 Lumbar Seat Bladder Installation

C. SHOULDER HARNESS INERTIA REEL ADJUSTMENT

Shoulder harnesses with inertia reels are on each front seat and are available for all rear seats. Check inertia reel mechanism by pulling sharply on strap. Check reel will lock in place under sudden stress. The locking feature prevents strap from extending, and holds occupant in place. For normal movement strap will extend and retract as required. On aircraft with a single strap adjustable shoulder harness (above the side window for each front seat) shoulder strap is routed over the shoulder by the window and attached to the lap belt at the occupant's hip. Adjust strap so all controls are accessible while maintaining adequate restraint. Optional shoulder straps are available for rear occupants. Shoulder harnesses must be worn during takeoff, landing, and for an inflight emergency situation. Adjust inertia reel as follows:

1. Allow harness to wind up on the reel as much as possible.
2. Pry off the plastic cap over the spring, on the end of the reel. Check spring does not come out of the plastic cap. Set cap aside.
3. Unwind harness completely, measure and mark harness 24 inches from reel center.
4. Wind harness onto reel until 24 inch mark is reached. Hold reel and place cap with spring over reel shaft end.
5. Align slot in shaft with spring tang, wind spring 6 turns ±1/2 turn and snap plastic cover into holes in reel end shaft.
6. Release harness, allowing it to wind up, and extend harness a few times to check reel for smooth operation.
7. With reel fully wound, hold inertia mechanism end up and pry off plastic cap over mechanism and set reel aside.
8. lnstall nut in plastic cap so stud in cap is flush with nut surface, position cap over reel end and snap in place. Extend harness a few times to verify proper action.

-END-

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

27

FLIGHT CONTROLS

2A24

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
27-00-00	GENERAL	2B3	
27-00-00	Description and Operation	2B3	
27-00-00	Standard Procedures	2B3	
27-00-00	Control Cable Inspection	2B4	
27-00-00	Cable Damage	2B4	
27-00-00	External Wear Pattern	2B6	
27-00-00	Internal Cable Wear	2B6	
27-00-00	Corrosion	2B7	
27-00-00	Cable Maintenance	2B8	
27-00-00	Cabe Fittings	2B8	
27-00-00	Pulleys	2B8	
27-10-00	AILERON CONTROLS	2B11	
27-10-00	Troubleshooting	2B11	
27-10-00	Control Column	2B12	
27-10-00	Removal Of Control Column Assembly	2B12	
27-10-00	Installation Of Control Column Assembly	2B14	
27-10-00	Aileron Control Cables	2B16	
27-10-00	Removal Of Aileron Control Cables	2B16	
27-10-00	Installation Of Aileron Control Cables	2B18	
	Aileron Bellcrank Assembly	2B18	
27-10-00	Removal Of Aileron Bellcrank \ Assembly	2B18	
27-10-00	Installation Of Aileron Bellcrank Assembly	2B19	
27-10-00	Rigging And Adjustment Of Aileron Controls	2B19	
27-20-00			
27-20-00	RUDDER AND TAB	2B16	
27-21-00	Rudder and Steering Pedal Assembly	2B16	
27-21-00	Removal of Rudder and Steering Pedal Assembly	2B16	
27-21-00	Installation of Rudder and Steering Pedal Assembly	2B17	
27-22-00	Rudder Control Cables	2B22	
27-22-00	Removal of Rudder Control Cables	2B22	
27-22-00	Installation of Rudder Control Cables	2B22	
27-23-00	Rigging and Adjustment of Rudder Controls	2B23	

CHAPTER 27 - FLIGHT CONTROLS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
27-24-00	Rudder Trim Controls	2B24	
27-24-00	Removal of Rudder Trim Controls	2B24	
27-24-00	Installation of Rudder Trim Controls	2B24	
27-24-00	Rigging and Adjustment of Rudder Trim Controls	2B24	
27-30-00	STABILATOR AND TAB	2C2	
27-31-00	Stabilator Control Cables	2C2	
27-31-00	Removal of Stabilator Control Cables	2C2	
27-31-00	Installation of Stabilator Control Cables	2C2	
27-32-00	Rigging and Adjustment of Stabilator Controls	2C4	
27-30-00	STABILATOR AND TAB (contd)	—	
27-33-00	Stabilator Trim Controls	2C7	
27-33-00	Stabilator Trim Assembly	2C7	
27-33-00	Removal of Stabilator Trim Assembly (Forward)	2C7	
27-33-00	Installation of Stabilator Trim Assembly (Forward)	2C8	
27-33-00	Removal of Stabilator Trim Assembly (Aft)	2C10	
27-33-00	Installation of Stabilator Trim Assembly (Aft)	2C10	
27-33-00	Rigging and Adjustment of Stabilator Trim2	C11	
27-50-00	FLAPS	2C12	
27-51-00	Wing Flap Controls	2C12	
27-51-00	Removal of Wing Flap Controls	2C12	
27-51-00	Installation of Wing Flap Controls	2C14	
27-52-00	Rigging and Adjustment of Wing Flaps	2C16	

GENERAL

This chapter contains the explanation for the removal, installation, rigging and adjustment procedures for the control assemblies of the various structural surfaces. The assemblies need not be removed in order of paragraphs since each paragraph describes the individual removal and installation of the component.

A. DESCRIPTION AND OPERATION

The PA-28-181 is controlled in flight by three standard primary control surfaces: ailerons, stabilator, and rudder. Controls operation is through movement of the dual control columns and dual rudder pedals. Individual surfaces are connected to their control components by cables and push-pull tubes. Directional and longitudinal trim control is provided by an adjustable trim mechanism for the rudder and stabilator. Flaps are mechanically operated and can be positioned in four locations of 0, 10, 25, and 40 degrees.

Aileron controls consist of two control wheels connected by torque tubes to sprockets on each end of the horizontal control column. A chain is wrapped around sprockets and around a double sprocket on the vertical post of the control column. The chain is connected to the primary aileron control cable which is routed through the center of fuselage, to main spar, and out through wings to a bellcrank in each wing. A balance cable is also connected to the bellcrank. As control wheels are moved, control cables move bellcranks and actuate push-pull rods to move ailerons.

Stabilator controls are also connected to the control column. From connecting point, cables are routed around pulleys under the floor, and aft to tail section. Aft end of cables connect to stabilator balance arm which is connected to the stabilator. When control wheels are moved forward or aft, cables move balance arm up and down rotating the stabilator on hinge points.

The rudder is controlled by pilot and copilot rudder pedals. Cables are connected to both sides of rudder pedal assembly and routed aft through the bottom of fuselage to rudder horn. When one rudder pedal is pushed, cables move in opposite directions turning rudder horn and rudder. The wing flap system is operated by a lever between the front seats.

B. STANDARD PROCEDURES

— CAUTION —

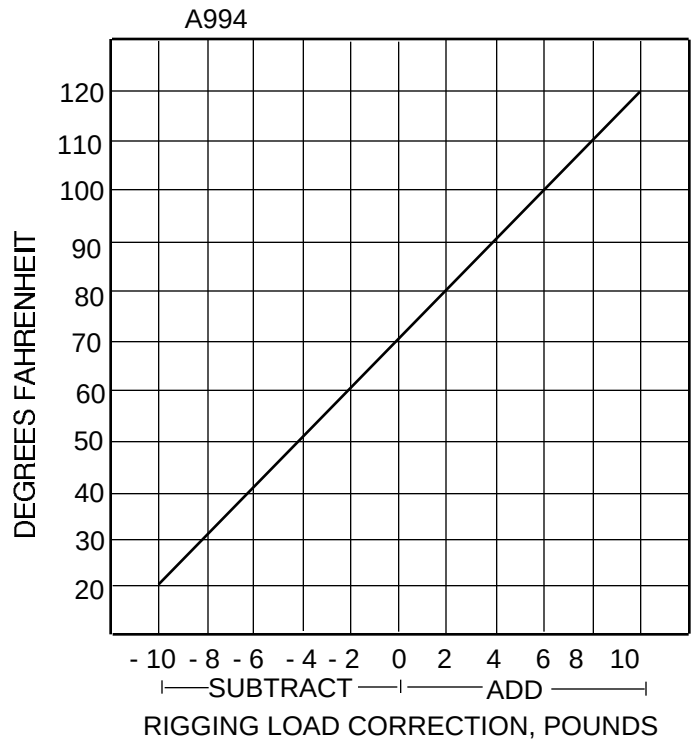
Cable rigging tensions specified must be corrected to ambient temperature where tension is being checked, using chart 2701.

The following tips for assembly removal, installation, and rigging:

1. Level and place airplane on jacks during rigging and adjustment.
2. Remove turnbuckle barrels from cable ends before withdrawing cables through structures.
3. Tie a cord to cable end before withdrawing cable through structures to aid cable installation.
4. Turnbuckle stations are given at their neutral positions.
5. Mark cable end with a felt marking pen before disconnecting.
6. Assemble and adjust turnbuckles so each terminal is screwed an approximate equal distance into the barrel. Do not turn the terminals as a permanent twist in the cables will result.
7. Check cable tensions with the control surface in neutral position.
8. After each adjustment, check turnbuckles to verify not more than three terminal threads are visible outside barrel. Install locking clips, and check for proper installation by trying to remove clips using fingers only. Locking clips may be installed in opposite holes. Once removed, do not reuse locking clips. Safety turnbuckles per Advisory Circular 43.13-lA Chapter 4, Section 2.

9. When push rods or rod ends have an inspection hole, the screw must be screwed in far enough to pass the inspection hole. Test visually or by feel, by inserting a piece of wire into inspection hole. If no hole is provided, there must be a minimum of 0.375 inch thread engagement.
10. Refer to Figure 27-1 for proper rod end jam nuts installation.
11. Tighten jam nuts. Install pulley guard pins.
12. Torque all nuts in the flight control system per Chart 9102, Recommended Nut Torques.

CHART 2701. CABLE TENSION VS. AMBIENT TEMPERATURE



C. CONTROL CABLE INSPECTION

Aircraft control cable systems are subject to a variety of environmental conditions and forms of deterioration that, with time, may be easy to recognize as wire/strand breakage or the not-so-readily visible types of wear, corrosion, and/or distortion. The following data may help in detecting the presence of these conditions:

1. Cable Damage

Critical areas for wire breakage are sections of the cable which pass through fairleads and around pulleys. To inspect each section which passes over a pulley or through a fairlead, remove cable from aircraft to the extent necessary to expose that particular section. Examine cables for broken wires by passing a cloth along length of cable. This will clean the cable for a visual inspection, and detect broken wires, if the cloth snags on cable. When snags are found, closely examine cable to determine full extent of damage.

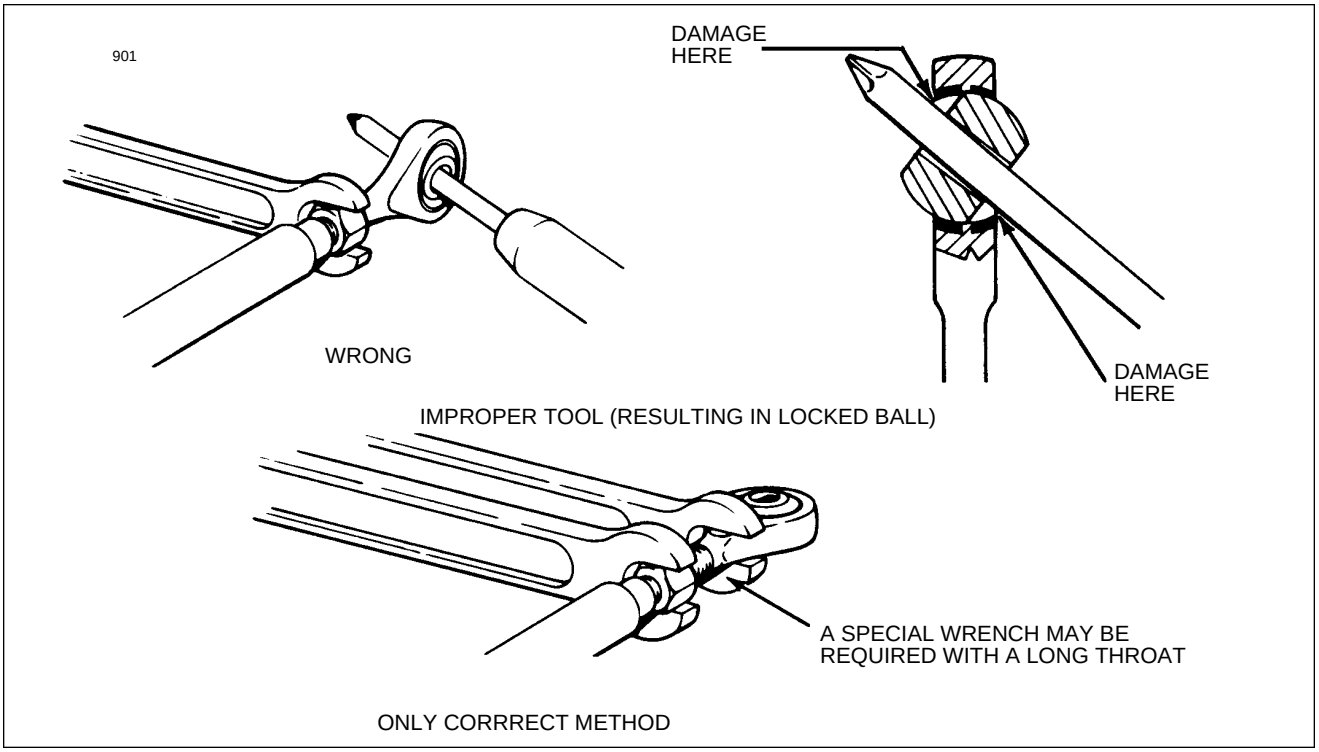


Figure 27-1. Rod End Installation Method

The absence of snags is not positive evidence that broken wires do not exist. Figure 27-2A shows a cable with broken wires that were not detected by wiping, but were found during a visual inspection. The damage became readily apparent (Figure 27-2B) when the cable was removed and bent using the techniques depicted in Figure 27-2C.

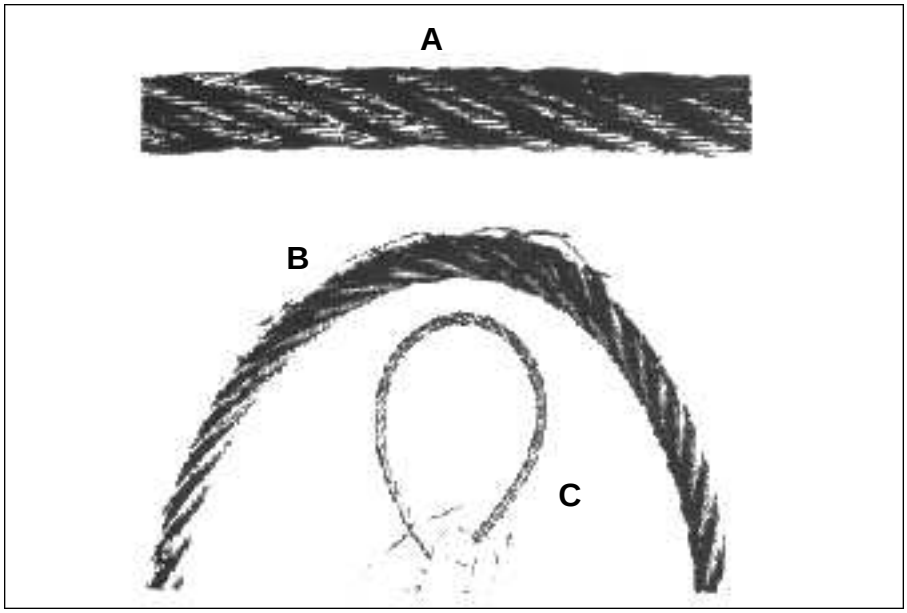
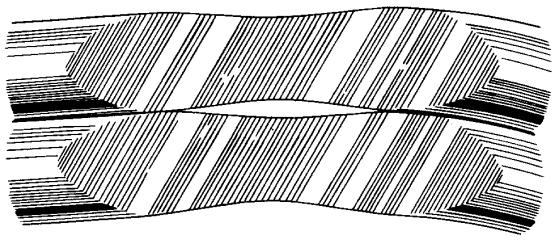


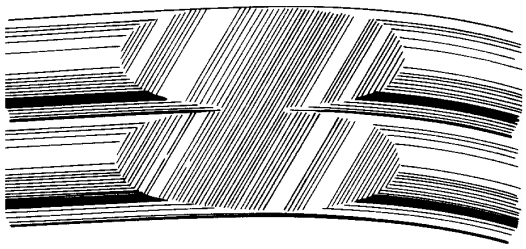
Figure 27-2 Control Cable Inspection Technique

2. External Wear Patterns

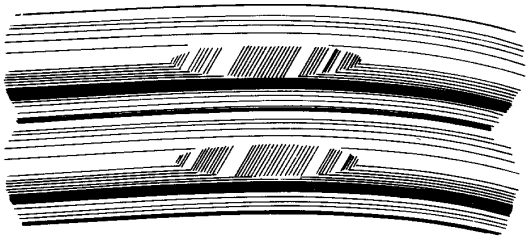
Wear will normally extend along cable equal to the distance cable moves at that location. Wear may occur on one side of the cable only or on its entire circumference. Replace flexible and non-flexible cables when individual wires in each strand appear to blend together (outer wires worn 40-50 percent) as depicted in Figure 27-3.



INDIVIDUAL OUTER WIRES WORN MORE TH AN 50%



INDIVIDUAL OUTER WIRES WORN MORE THAN 40 – 50 % (NOTE BLENDING OF WORN AREAS)



INDIVIDUAL OUTER WIRES WORN LESS THAN 40% (WORN AREAS INDIVIDUALLY DISTINGUISHABLE)

Figure 27-3 Cable Wear Patterns

3. Internal Cable Wear

As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys and quadrants. This condition, shown in Figure 27-4, is not easily detected unless the strands of the cable are separated. Wear of this type is a result of the relative motion between inner wire surfaces. Under certain conditions the rate of this type wear can be greater than that occurring on the surface.

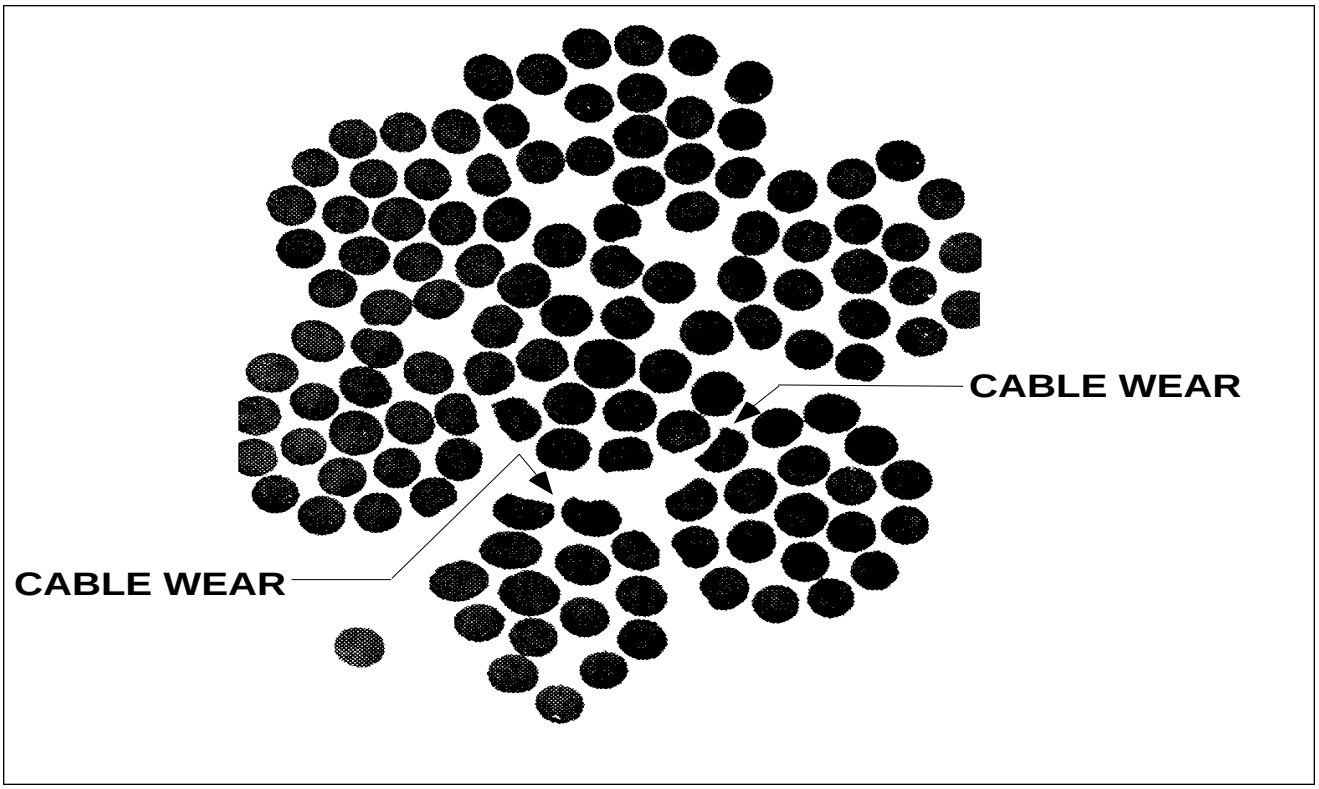


Figure 27-4 Internal Cable Wear

4. Corrosion

Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear producing airframe components such as pulleys, fairleads, etc. It may be necessary to remove and bend the cable to properly inspect it for internal strand corrosion as this condition is usually not evident on the outer surface of the cable. Replace cable segments if internal strand rust or corrosion is found.

Areas especially conducive to cable corrosion are battery compartments, lavatories, wheel wells, etc., where concentrations of corrosive fumes, vapors, and liquids can accumulate.

– NOTE –

Check all exposed sections of cable for corrosion after a clean - ing and/or metal-brightening operation has been accomplished in that area.

THIS SPACE INTENTIONALLY LEFT BLANK

5. Cable Maintenance

Frequent inspections and preservation measures such as rust prevention treatments for bare cable areas will help to extend cable service life. Where cables pass through fairleads, pressure seals, or over pulleys, remove accumulated heavy coatings of corrosion prevention compound. Provide corrosion protection for these cable sections by lubricating with a light coat of graphite grease or general purpose, low-temperature oil.

– CAUTION –

Avoid use of vapor degreasing, steam cleaning, methylethylke - tone (MEK) or other solvents to remove corrosion-preventative compounds, as these methods will also remove cable internal lubricant.

6. Cable Fittings

Check swaged terminal reference marks for an indication of cable slippage within fitting. Inspect fitting assembly for distortion and/or broken strands at the terminal. Assure that all bearings and swivel fittings (bolted or pinned) pivot freely to prevent binding and subsequent failure. Check turnbuckles for proper thread exposure and broken or missing safety wires/clips.

7. Pulleys

Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bearings to assure proper lubrication, smooth rotation, freedom from flat spots, dirt, and paint spray. Periodically rotate pulleys, which turn through a small arc, to provide a new bearing surface for the cable. Maintain pulley alignment to prevent the cable from riding on flanges and chafing against guards, covers, or adjacent structure. Check all pulley brackets and guards for damage, alignment, and security.

a. Pulley Wear Patterns

Various cable system malfunctions may be detected by analyzing pulley conditions. These include such discrepancies as too much tension, misalignment, pulley bearing problems, and size mismatches between cables and pulleys. Examples of these conditions are shown in Figure 27-5.

THIS SPACE INTENTIONALLY LEFT BLANK

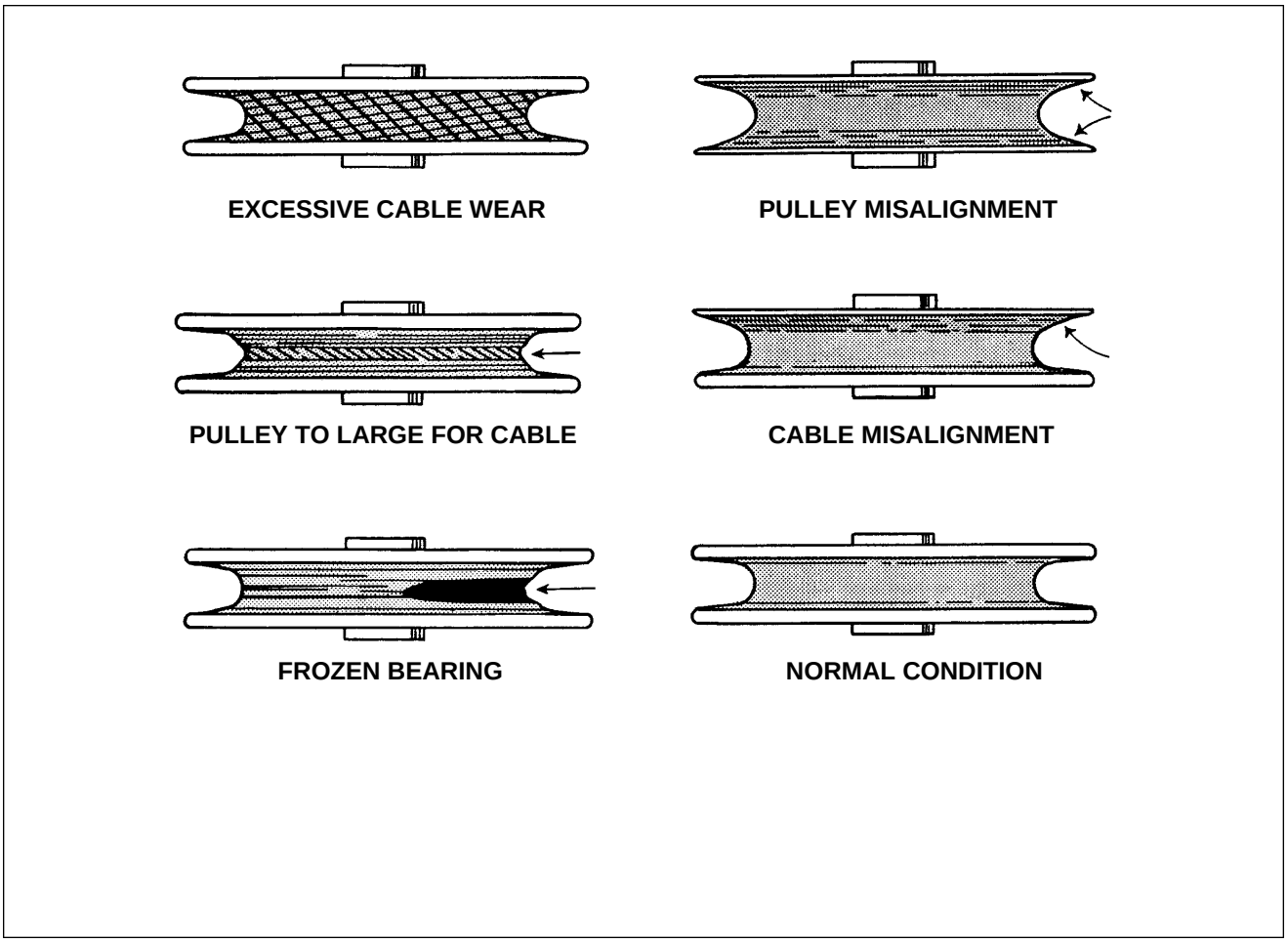


Figure 27-5 Pulley Wear Patterns

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

AILERON CONTROLS

A. TROUBLESHOOTING

Chart 2702 lists troubles peculiar to aileron flight controls along with their probable causes and suggested remedies. When troubleshooting the aileron flight controls, additional reference may be obtained from Chapter 57 on control surface balancing, if required. After the trouble has been corrected, check the entire aileron flight control system for security and operation.

CHART 2702. TROUBLESHOOTING AILERON CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between control wheel and aileron.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
Resistance to control wheel rotation.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Control column horizontal chain improperly adjusted.	Adjust chain tension.
	Pulleys binding or rubbing.	Replace binding pulleys and/or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
	Bent aileron and/or hinge.	Repair or replace aileron and/or hinge.
	Cables crossed or routed incorrect.	Check routing of control cables.

CHART 2702. TROUBLESHOOTING AILERON CONTROL SYSTEM (continued)

Trouble	Cause	Remedy
Control wheels not synchronized.	Incorrect control column rigging.	Rerig control column.
Control wheels not horizontal when ailerons are neutral.	Incorrect rigging of aileron system.	Rerig aileron system.
Incorrect aileron travel.	Aileron control rods not adjusted properly. Aileron bellcrank stops not adjusted properly.	Adjust control rods. Adjust bellcrank stops.
Correct aileron travel cannot be obtained by adjusting bellcrank stops.	Incorrect rigging of aileron cables, control wheel and control rod.	Rerig controls.
Control wheel stops before control surfaces reach full travel.	Incorrect rigging between control wheel and control cables.	Rerig controls.

B, CONTROL COLUMN

1. Removal Of Control Column Assembly (Refer to Figure 27-6.)

a. Remove either control wheel with tube as follows:
   (1) Separate control wheel tube from flexible joint located on either side of tee bar assembly, by removing nut, washer, and bolt. Pull tube from flexible joint.
   (2) To remove left control tube, slide the stop from tube.
   (3) Disconnect autopilot systems wiring in control tube at the quick disconnect terminals behind instrument panel. Draw wires back into the tube and out the tube forward end.
   (4) Remove control wheel assembly from instrument panel.

b. Remove tee bar assembly as follows:
   (1) Remove access panel or door to aft section of fuselage.
   (2) Relieve cable tension from stabilator control cables at one of the stabilator cable turnbuckles in the aft section of fuselage.
   (3) Relieve tension from aileron control cables and chains, and at the turnbuckle connecting chains to tee bar top.
   (4) Disconnect control chains from control cables, where the chains and cables join, by removing the cotter pins, nuts, bolts, and bushings.

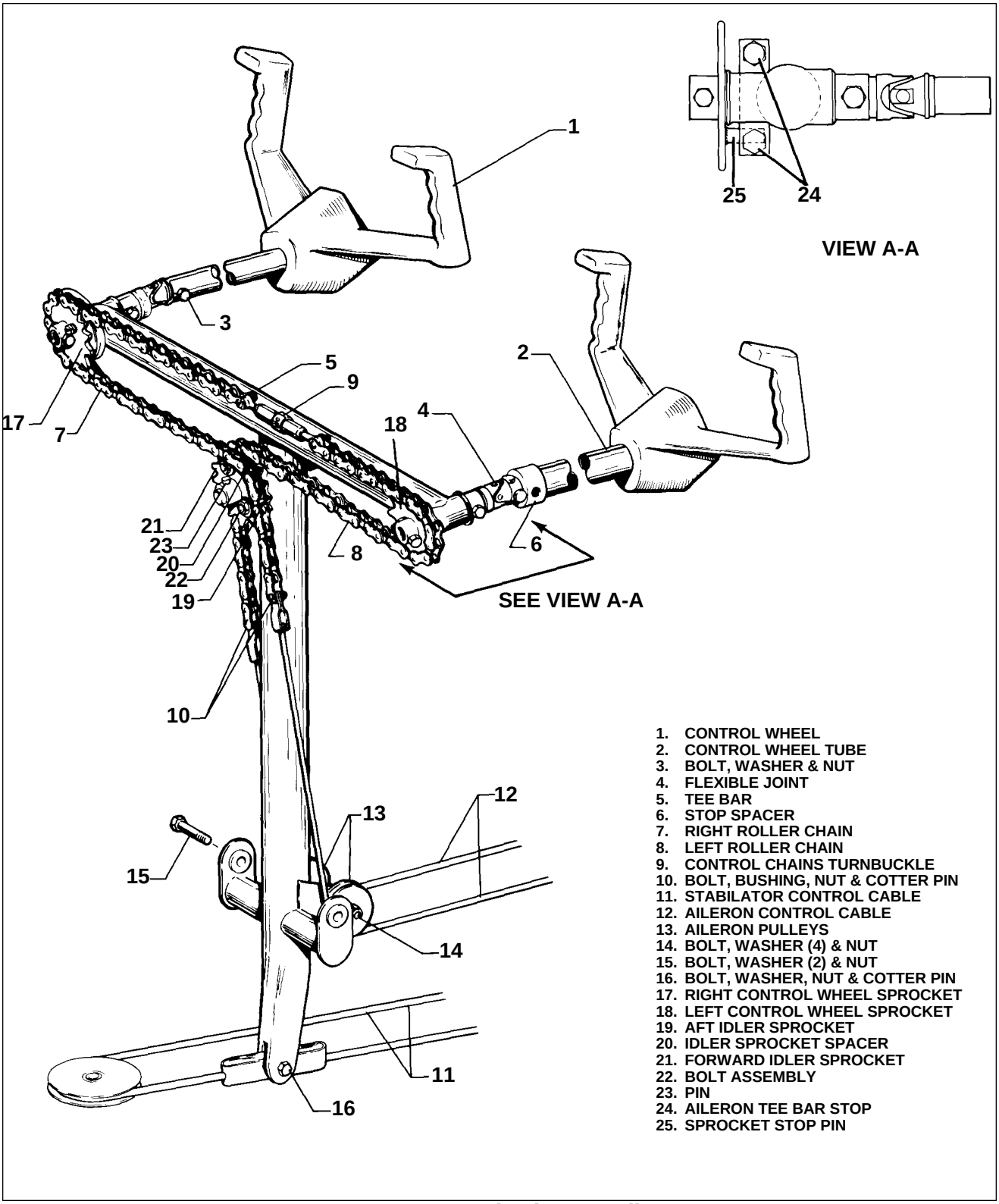

VIEW A-A
SEE VIEW A-A
1. CONTROL WHEEL
2. CONTROL WHEEL TUBE
3. BOLT, WASHER & NUT
4. FLEXIBLE JOINT
5. TEE BAR
6. STOP SPACER
7. RIGHT ROLLER CHAIN
8. LEFT ROLLER CHAIN
9. CONTROL CHAINS TURNBUCKLE
10. BOLT, BUSHING, NUT & COTTER PIN
11. STABILATOR CONTROL CABLE
12. AILERON CONTROL CABLE
13. AILERON PULLEYS
14. BOLT, WASHER (4) & NUT
15. BOLT, WASHER (2) & NUT
16. BOLT, WASHER, NUT & COTTER PIN
17. RIGHT CONTROL WHEEL SPROCKET
18. LEFT CONTROL WHEEL SPROCKET
19. AFT IDLER SPROCKET
20. IDLER SPROCKET SPACER
21. FORWARD IDLER SPROCKET
22. BOLT ASSEMBLY
23. PIN
24. AILERON TEE BAR STOP
25. SPROCKET STOP PIN

Figure 27-6. Control Column Installation

(5) Remove tunnel cover as follows:
  (a) Remove rudder trim control knob and trim cover attaching screws.
  (b) Roll back carpet from tunnel and remove tunnel plate located aft of tee bar assembly, by removing plate attaching screws.
(6) Remove the two aileron control cable pulleys attached to lower section of tee bar by removing pulley attaching bolt.
(7) Disconnect stabilator controls from lower end of tee bar assembly.
(8) Disconnect the mixture control, throttle control, etc., to allow tee bar assembly removal.
(9) Remove tee bar assembly by removing attaching bolts with washers and nuts (through each side of floor tunnel) and lift it up and out through right side of cabin.

3. Installation Of Control Column Assembly (Refer to Figure 27-6.)

a. Install tee bar assembly as follows:
(1) Swing tee bar assembly into place from right side of cabin and secure with attaching bolts, washers, and nuts inserted through each side of floor tunnel.
(2) Connect stabilator controls to lower end of tee bar with bolt, washer, nut, and cotter pin. Cable ends must be free to rotate.
(3) Place aileron control cables around pulleys that attach to the lower section of tee bar. Position pulleys and secure with bolt, washers, and nut.
(4) Install control wheel per step 2b.
(5) Place control wheels in neutral (centered) position and install aileron control chains on control wheel sprockets and idler crossover sprockets. This turnbuckle must be centered between the two control wheel sprockets.
(6) Loosen connecting bolts of idler sprockets to allow snug fit of chain around control wheel sprockets and over idler sprockets.
(7) Connect aileron control cables to chain ends with bolts, bushings, nuts, and cotter pins.
(8) Adjust chain turnbuckle between the two control wheel sprockets to allow control wheels to be neutral and obtain proper cable tension. To have both control wheels neutral, set chain turnbuckle to neutralize wheels and set cable tension with turnbuckles (under floor panel aft of main spar) per rigging and adjustment of aileron controls. Before safetying turnbuckle, verify when ailerons are neutral, the control wheels are neutral, and chain turnbuckle centered. Aileron bellcranks must contact their stops before control wheel hits its stop. Maintain 0.030 to 0.040 inch clearance between sprocket pin and adjustable stop bolts on models with adjustable aileron tee bar stops.
(9) Set stabilator cable tension with turnbuckle in the aft section of fuselage per instructions in rigging and adjustment of stabilator controls. Complete adjustments and check safety of all turnbuckles.
(10) Tighten connecting bolts of the idler sprockets.
(11) Install floor tunnel plate trim covers as follows:
  (a) Position tunnel plate and install and secure with proper screws.
  (b) Roll carpet into place and install rudder trim cover and knob with a clevis pin and cotter pin.
  (c) Replace fuel selector and rudder trim knob.

b. Install either control wheel assembly as follows:
   (1) Insert control wheel tube through instrument panel.
   (2) Install autopilot systems wiring in the control tube and route the wires through hole in the forward side of tube and out the small hole in forward side. Position rudder grommet in the hole in the side of tube.
   (3) Install stop on left control tube.
   (4) Connect control wheel tube to the flexible joint of tee bar assembly. If the control cables or chains have not been removed or loosened, place ailerons in neutral and install control tube on the flexible joint to allow control wheel to be neutral. Install and tighten bolt, washer, and nut.

c. To Install Flex Joint Replacement (Refer to Figures 27-6 and 27-7)
   (1) Carefully lay out location for hole to be drilled in flex joint tube to match hole in control column shaft.
   (2) Using a #5 (0.2055) drill bit, drill hole through flex joint tube at location determined in paragraph (1).
   (3) Ream drilled hole, in steps, with a #1 reamer, checking to insure proper depth for taper pin and sufficient pin thread protrusion for proper installation.

– NOTE –

Reamer may be purchased from Enstice Tool Co., Palm Bay, Florida.

   (4) Install pin through tube and shaft.
      (a) If pin shoulder does ***not*** protruded past tube surface, install a AN960-10 washer
      (b) If pin shoulder ***does*** protruded past tube surface, install a MS20364-1032C washer
   (5) Install nut. Torque 35 - 40 inch-pounds.

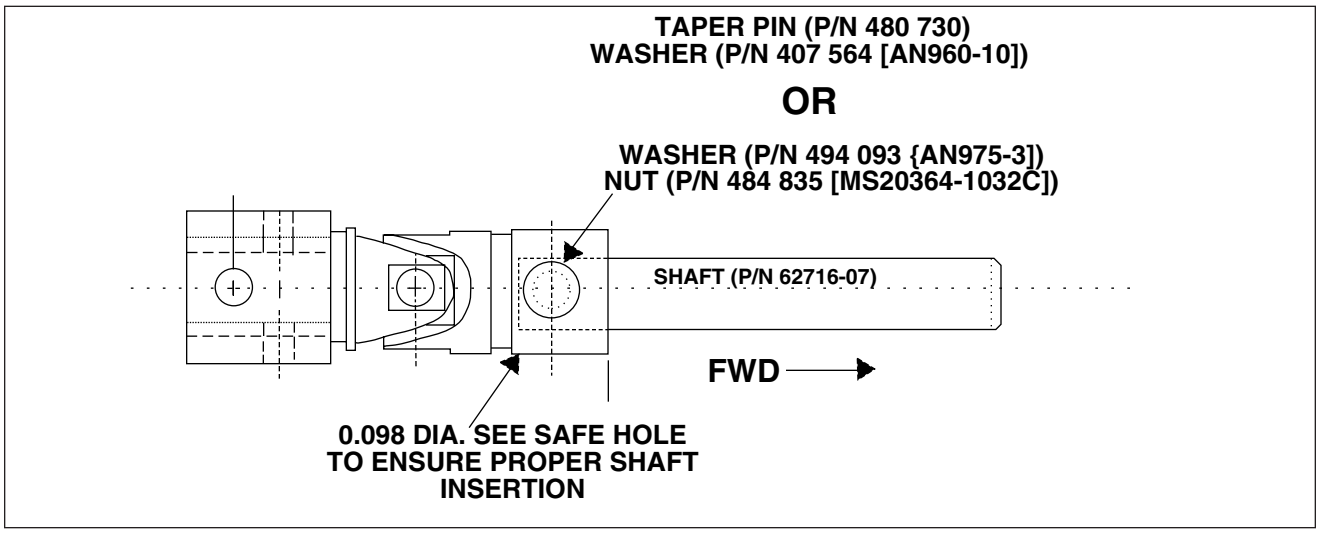


Figure 27-7. Flex (Universal) Joint Assembly)

C. AILERON CONTROL CABLES

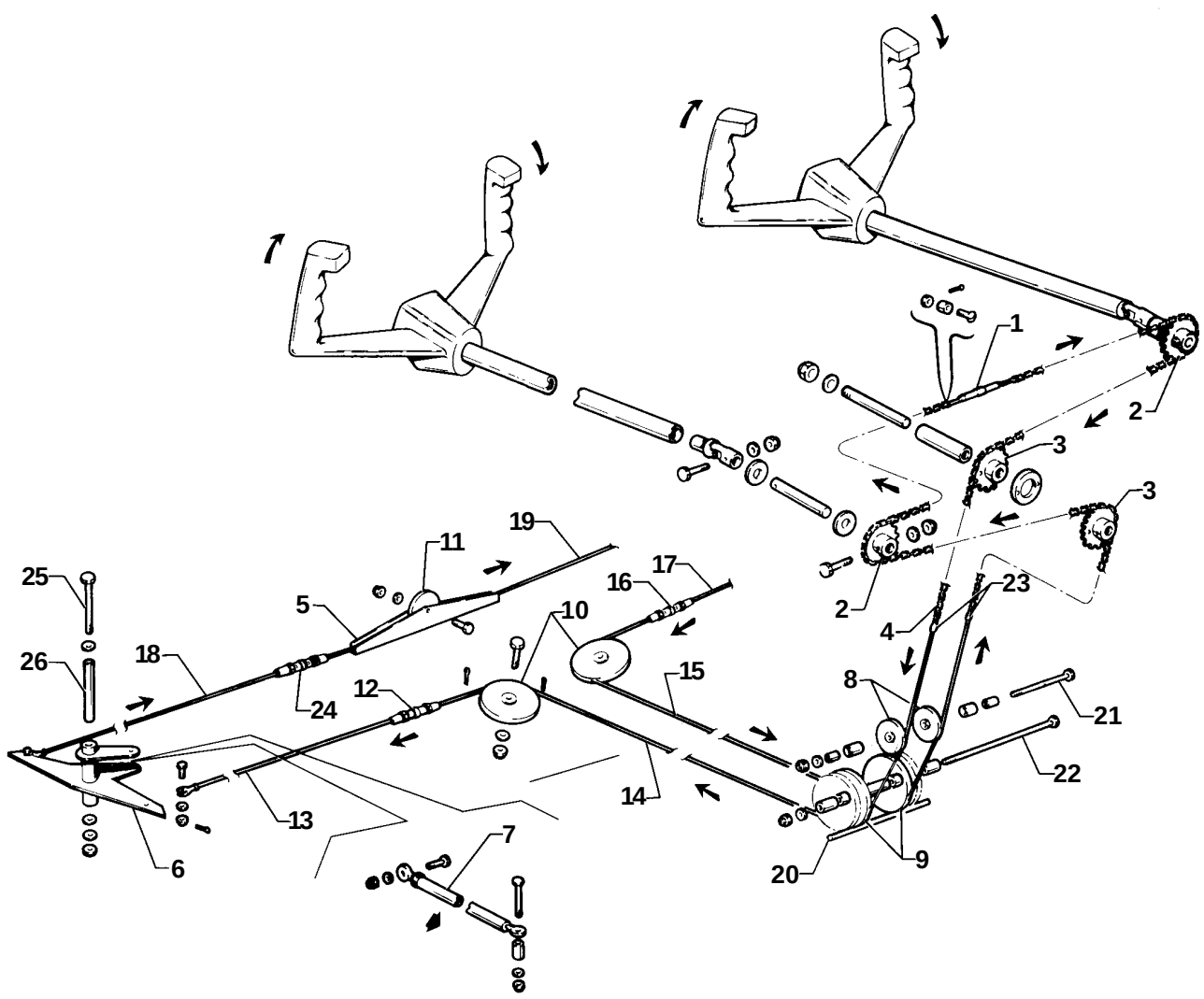
1. Removal Of Aileron Control Cables (Refer to Figure 27-8.)

a. Remove rear seat and floor panel to access control cables in fuselage or wings.
b. Remove right or left primary control cables in the fuselage as follows:
   (1) Remove the two front seats.
   (2) Remove tunnel cover located aft of tee bar assembly as follows:
      (a) Remove rudder trim control knob and trim cover attaching screws.
      (b) Roll back carpet from tunnel and remove tunnel plate, located aft of tee bar assembly, by removing the plate attaching screws.

— NOTE —

To aid in control cables installation mark the cable ends and attach a line before drawing them through fuselage or wing.

   (3) Separate primary control cable at the turnbuckle under rear seat or floor panel aft of main spar.
   (4) Remove cable pulleys attached to lower section of control column tee bar assembly by removing pulley attaching bolt.
   (5) Move cable guard under pulley cluster located just aft of lower portion of tee bar by removing cotter pin from exposed end of guard. Slide guard left or right as required.
   (6) Remove cotter pins (used as cable guards) at the pulley in forward area of floor opening aft of main spar.
   (7) Disconnect cable from control chain at control column tee bar assembly by removing cotter pin, nut, bolt, and bushing that connect the two. Secure chains to prevent un- wrapping from around sprockets.
   (8) Pull cable back through floor tunnel.
c. Remove primary control cable from either wing as follows:
   (1) Remove access plate to aileron bellcrank on the underside of wing forward of the inboard end of aileron.
   (2) Separate cable at the turnbuckle located aft of the main spar.
   (3) Remove cotter pin, nut, washer, and bolt to disconnect cable from forward end of aileron bellcrank.
   (4) Pull cable from wing.
d. Remove either balance cable as follows:
   (1) Separate balance cable at turnbuckle in right side of the opening aft of main spar.
   (2) If the left balance cable is to be removed, remove cotter pin used as a cable guard at the pulley in the center of the opening.
   (3) Remove access plate to aileron bellcrank on the underside of wing forward of the inboard end of aileron.
   (4) Remove cotter pin, nut, washer, and bolt to disconnect cable from aft end of aileron bellcrank.
   (5) Pull cable from wing.



1. CONTROL CHAINS TURNBUCKLE
2. CONTROL WHEEL SPROCKET
3. IDLER SPROCKET
4. AILERON CONTROL CHAIN
5. PULLEY BRACKET
6. AILERON BELLCRANK
7. AILERON CONTROL ROD
8. TEE BAR PULLEY
9. FORWARD CLUSTER PULLEY
10. PRIMARY FORWARD CONTROL CABLE
11. BALANCE CABLE PULLEY
12. RIGHT PRIMARY TURNBUCKLE
13. RIGHT WING PRIMARY CABLE
14. RIGHT FUSELAGE PRIMARY CABLE
15. LEFT FUSELAGE PRIMARY CABLE
16. LEFT PRIMARY TURNBUCKLE
17. LEFT WING PRIMARY CABLE
18. RIGHT BALANCE CABLE
19. LEFT BALANCE CABLE
20. CABLE GUARD ROD
21. BOLT, WASHER & NUT
22. BOLT, WASHER & NUT
23. BOLT, NUT, BUSHING & COTTER PIN
24. BALANCE CABLE TURNBUCKLE
25. BELLCRANK PIVOT BOLT
26. BELLCRANK BUSHING

Figure 27-8. Aileron Controls (Typical)

2. Installation Of Aileron Control Cables (Refer to Figure 27-8.)

a. Install right or left primary control cable in fuselage as follows:
   (1) Pull cable through fuselage floor tunnel.
   (2) Connect cable to end of control chain and secure, using bushing, bolt, nut, and cotter pin.
   (3) Place cable around pulley located in the tunnel aft of tee bar. Install cable guard and secure with cotter pin.
   (4) Position cables and install cable pulleys to lower section of tee bar assembly. Secure with bolt, washer, and nut.
   (5) Place cable around pulley in access opening just aft of main spar and install cotter pin cable guards.
   (6) If primary control cable in wing is installed, connect control cable ends at the turnbuckle in the access opening just aft of main spar.
   (7) Check rigging and adjustment per rigging and adjustment of aileron controls.
   (8) Install floor tunnel plate trim covers as follows:
      (a) Place tunnel plate into position and secure with attachment screws.
      (b) Roll carpet into place and install rudder trim cover and knob.

b. Install primary control cable (either wing) as follows:
   (1) Insert control cable into wing.
   (2) Connect cable to forward end of aileron bellcrank, using bolt, washer, nut, and cotter pin. Allow cable end to rotate freely on bellcrank.
   (3) If primary control cable in fuselage is installed, connect the ends at turnbuckle under rear seat aft of main spar.
   (4) Check rigging and adjustment per rigging and adjustment of aileron controls.
   (5) Install access plate on wing underside.

c. Install either balance cable as follows:
   (1) Insert cable into wing.
   (2) Connect cable to aft end of aileron bellcrank using a bolt, washer, nut, and cotter pin. Allow cable end to rotate freely on bellcrank.
   (3) Connect balance cable ends at the turnbuckle under rear seat aft of main spar.
   (4) If left cable was removed, install cotter pin cable guard at the pulley in fuselage aft of main spar.
   (5) Check rigging and adjustment per rigging and adjustment of aileron controls.
   (6) Install access plate on underside of wing.
   (7) Install floor panel, seat belt attachments, and seats.

D. AILERON BELLCRANK ASSEMBLY

1. Removal Of Aileron Bellcrank Assembly (Refer to Figure 27-8.)

a. Remove rear seats and floor panel.
b. Remove access plate to aileron bellcrank on underside of wing, forward of aileron inboard end.
c. Relieve tension from aileron control cables by loosening balance cable turnbuckle in the opening aft of main spar.
d. Disconnect primary and balance control cables from bellcrank assembly by removing cotter pins, nuts, washers, and bolts.

e. Disconnect aileron control rod by removing cotter pin,nut, washer, and bolt.
f. Remove nut (visible from wing underside), pivot bolt, and washers holding bellcrank.
g. Remove bellcrank from wing.

2.Installation Of Aileron Bellcrank Assembly (Refer to Figure 27-8.)

a. Check bellcrank pivot bushing is lubricated and install in the torque tube portion of bellcrank.
b. Place bellcrank in position with a washer located between each end of the torque tube and mounting brackets.
c. Install bellcrank pivot bolt with head up. Install washer and nut on bolt, and tighten nut to torque of 20 to 25 inch-pounds. Check bellcrank rotates freely with little up-down play.
d. Install and adjust control rod and check aileron travel per rigging and adjustment of aileron controls.
e. Connect ends of primary and balance control cables to bellcrank using bolts, washers, nuts, and cotter pins. Allow cable ends to rotate freely on bellcrank.
f. Tighten control cables at balance cable turnbuckle in the floor opening aft of main spar. Check cable tension per rigging and adjustment of aileron controls.
g. Install access plate on wing underside and replace floor panel, seat belt attachments, and seats.

E. RIGGING AND ADJUSTMENT OF AILERON CONTROLS (Refer to Figures 27-9 and 27-11.)

— CAUTION —

Complete all rigging corrections. If an out of trim condition persists, it is possible trailing edge of aileron was used to move aircraft forward. This will result in slight bulging of aileron contour at the trailing edge and will cause an out of rig condition.

— CAUTION —

Flap adjustment must be complete before starting aileron adjustment.

1. Check and adjust aileron controls rigging by first setting right and left aileron bellcranks at neutral position as follows: (Check control chains are rigged per installation of control column assembly.)
   a. Remove access plate to each aileron bellcrank on wing underside, forward of inboard end of aileron, by removing plate attaching screws.
   b. Set bellcrank rigging tool, per Figure 27-11, between forward arm of each bellcrank and the adjacent rib. Make tool from dimensions given in Figure 27-11. The slotted tool end fits on arm forward of and adjacent to primary control cable end. Position the other tool end so the side of tool contacts aft side of bellcrank stop. Bellcrank must be moved to allow a snug fit of tool between bellcrank arm and rib. If necessary loosen a primary control cable or balance cable. Neutral position of bellcranks is the position at which forward and aft cable connection holes are an equal distance from adjacent outboard wing rib.

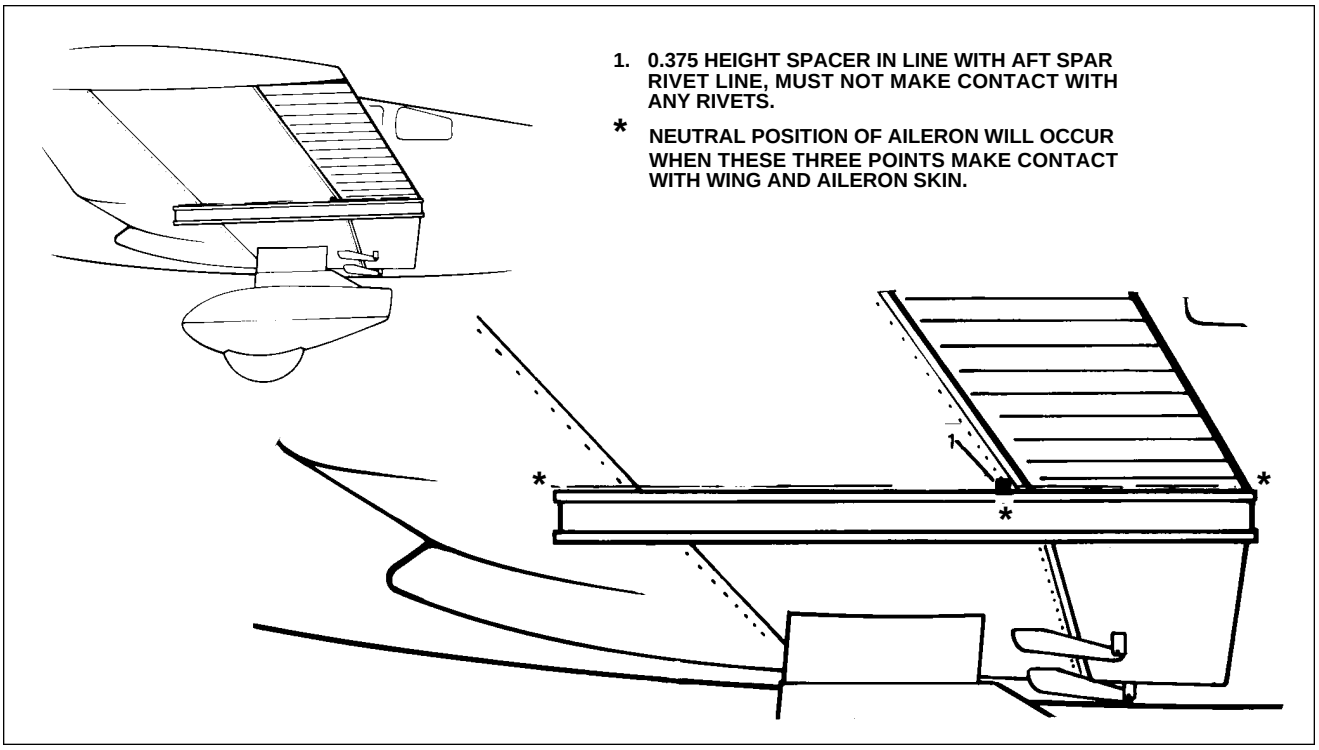

1. 0.375 HEIGHT SPACER IN LINE WITH AFT SPAR RIVET LINE, MUST NOT MAKE CONTACT WITH ANY RIVETS.
* NEUTRAL POSITION OF AILERON WILL OCCUR WHEN THESE THREE POINTS MAKE CONTACT WITH WING AND AILERON SKIN.
1
*
*
*

Figure 27-9. Aileron Rigging Tool

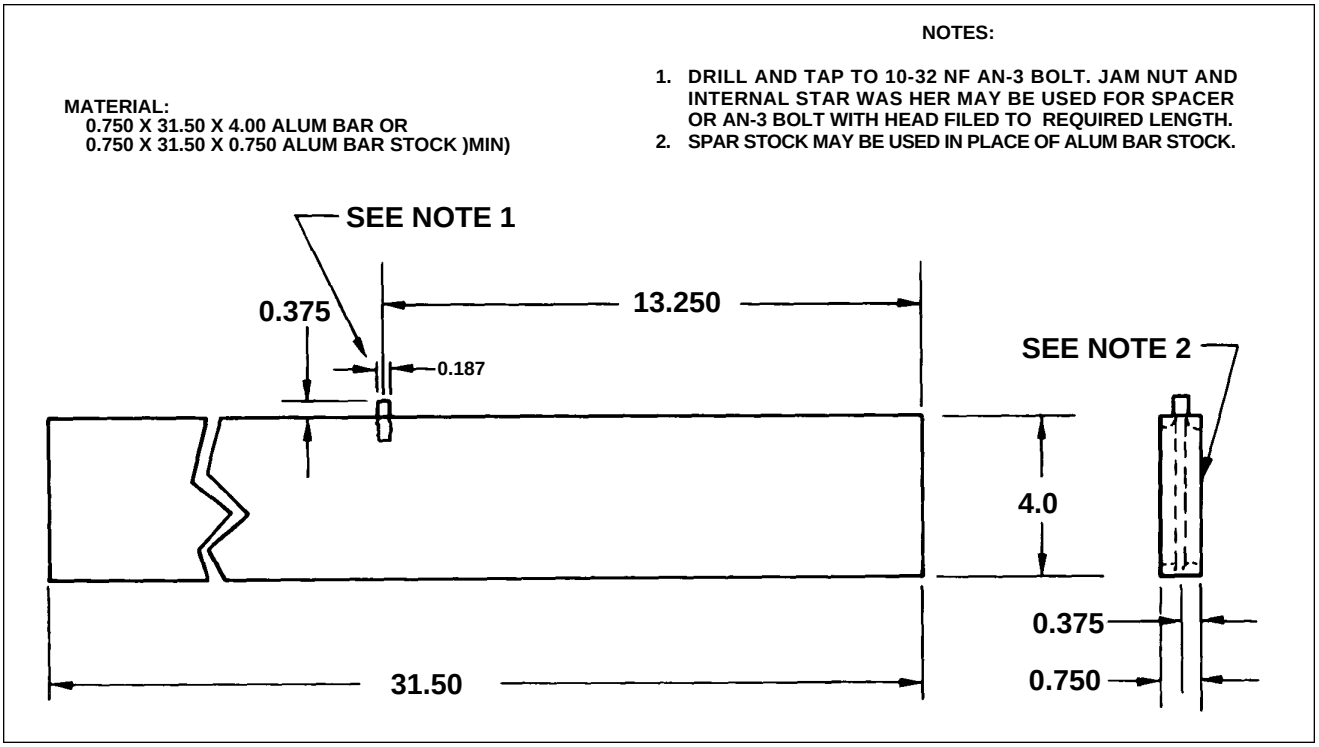

NOTES:
1. DRILL AND TAP TO 10-32 NF AN-3 BOLT. JAM NUT AND INTERNAL STAR WAS HER MAY BE USED FOR SPACER OR AN-3 BOLT WITH HEAD FILED TO REQUIRED LENGTH.
2. SPAR STOCK MAY BE USED IN PLACE OF ALUM BAR STOCK.
MATERIAL:
0.750 X 31.50 X 4.00 ALUM BAR OR
0.750 X 31.50 X 0.750 ALUM BAR STOCK)MIN)
SEE NOTE 1
0.375
13.250
0.187
SEE NOTE 2
4.0
0.375
0.750
31.50

Figure 27-10. Fabricated Aileron Rigging Tool

2. Set each bellcrank at neutral, check and adjust ailerons for neutral as follows:
   a. Check bellcrank rigging tool fits snug between bellcrank and rib.
   b. Place aileron rigging tool per Figure 27-9 against wing underside. Place tool close to inboard end of aileron without contacting any rivets. Tool must be positioned parallel with wing ribs. The aft end of tool must be even with aileron trailing edge. Make tool from dimensions given in figure 27-10.
   c. With aileron control rod connected between bellcrank and aileron, check wing surface contacts tool at its forward surface and at the spacer. Check trailing edge of flap contacts aft end of tool. Aileron is neutral at this position.
   d. If the three points do not contact, loosen jam nut at aft end of control rod and rotate the rod until the three points contact. Apply slight up pressure against trailing edge of aileron while making adjustment. Tighten jam nut after adjustment.
3. Adjust primary and balance cable tension per Figure 27-12 as follows:
   a. Remove front and rear seats for better access.
   b. Loosen connecting bolts of idler crossover sprockets at the control tee bar to allow chain to fit snug around control wheel sprockets and over idler sprockets.
   c. Check bellcranks are at neutral position.
   d. Adjust turnbuckles (in access opening just aft of main spar) of the primary and balance cables to their proper cable tension. Maintain neutral center position of control wheels. Obtain neutral position of both control wheels, by adjusting roller chain turnbuckle between control wheel sprockets. During adjustment, use a little more tension on primary control cables to hold bellcranks in neutral against rigging tools. Finish with even tension on all cables.
   e. Tighten bolts to secure idler crossover sprockets.
   f. Remove aileron bellcrank rigging tool from each wing.
4. Check ailerons for correct travel from neutral per Figure 27-12 dimensions as follows:
   a. Center protractor bubble over aileron surface at neutral position. Note the reading.
   b. Move aileron full up and down, and check degree of travel for each direction. Figure degree of travel on protractor by the difference between the protractor reading at neutral and up, and neutral and down. Bubble must be centered each reading.
   c. If travel is not correct, set by rotating bellcrank stops in or out. Stops are in the wing, attached to rib adjacent to aileron bellcrank.
   d. Use this procedure for each aileron.
5. Check bellcrank stops to verify bellcrank contact is made simultaneously, and still has cushion before contacting control wheel stops. Maintain 0.030 to 0.040 inch clearance between sprocket pin and adjustable stop bolts on models with adjustable tee bar stops.
6. Check complete system for operation and safety of turnbuckles, bolts, etc.
7. Install access plates and panels.

THIS SPACE INTENTIONALLY LEFT BLANK

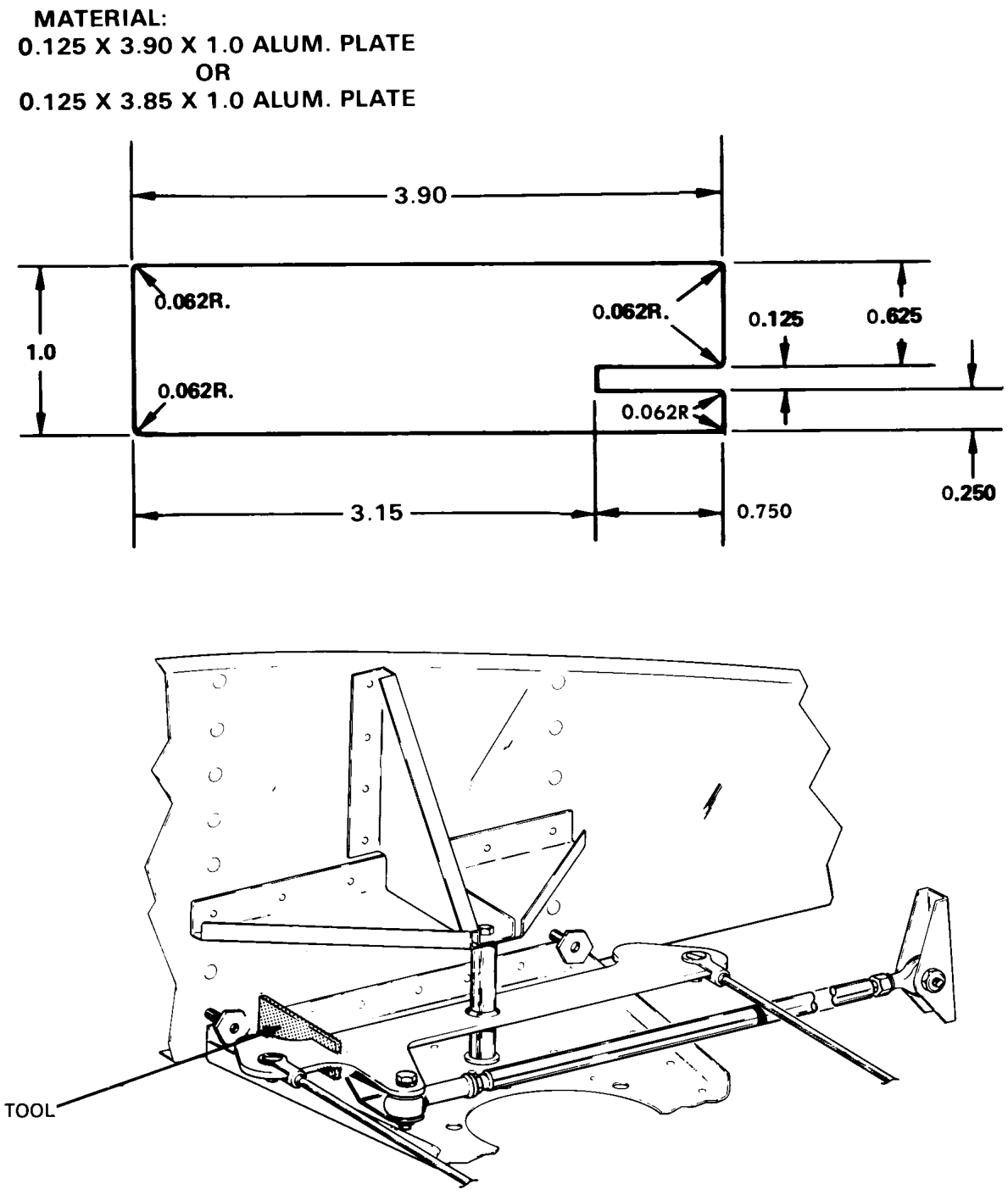


Figure 27-11. Bellcrank Rigging Tool

AILERON TRAVELS

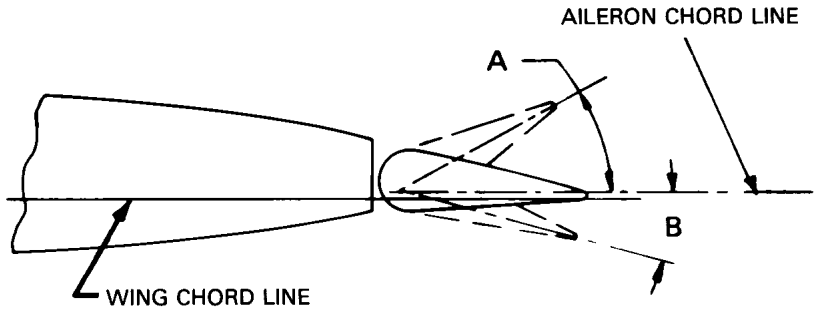
A 25° ± 2° UP

B 12° .5 ± 2° DN

CABLE TENSION

40 LB ± 5 LB

(SEE NOTE 3)



1. MAXIMUM FREE PLAY FOR AILERON IS 0.24 INCH, MEASURED AT TRAILING EDGE (UP/DOWN MOVEMENT).
2. MAXIMUM FREE PLAY SPANWISE IS 0.035 (INBOARD/OUTBOARD MOVEMENT).
3. CABLE TENSION APPLIES ONLY TO AIRPLANES WITHOUT AUTOPILOT BRIDLE CABLES ATTACHED. REFER TO APPROPRIATE AUTOPILOT SERVICE MANUAL FOR CALBE TENSION WHEN ATTACHING BRIDLE CABLES.

Figure 27-12. Aileron Rigging

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

RUDDER CONTROLS

A. TROUBLESHOOTING

Chart 2703 lists troubles peculiar to rudder control system along with their probable causes and suggested remedies. When troubleshooting the rudder control system, additional reference may be obtained from Chapter 55 on control surface balancing, if required. After the trouble has been corrected, check the entire rudder control system for security and operation.

CHART 2703. TROUBLESHOOTING RUDDER CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between rudder pedals and rudder.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Bolts attaching rudder to bellcrank are loose.	Tighten bellcrank bolts.
Excessive resistance to rudder pedal movement.	System not lubricated properly.	Lubricate system.
	Rudder pedal torque tube bearing in need of lubrication.	Lubricate torque tube bearings.
	Cable tension too high.	Adjust cable tension.
	Pulleys binding or rubbing.	Replace binding pulleys and/or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly. Check cable guards.
	Cables crossed or routed incorrectly.	Check routing of control cables.
Rudder pedals not neutral when rudder is streamlined.	Rudder cables incorrectly rigged.	Rerig rudder cables.
Incorrect rudder travel.	Rudder bellcrank stop incorrectly adjusted.	Rerig bellcrank stops.
	Nose wheel contacts stops before rudder.	Rerig nose wheel stops.

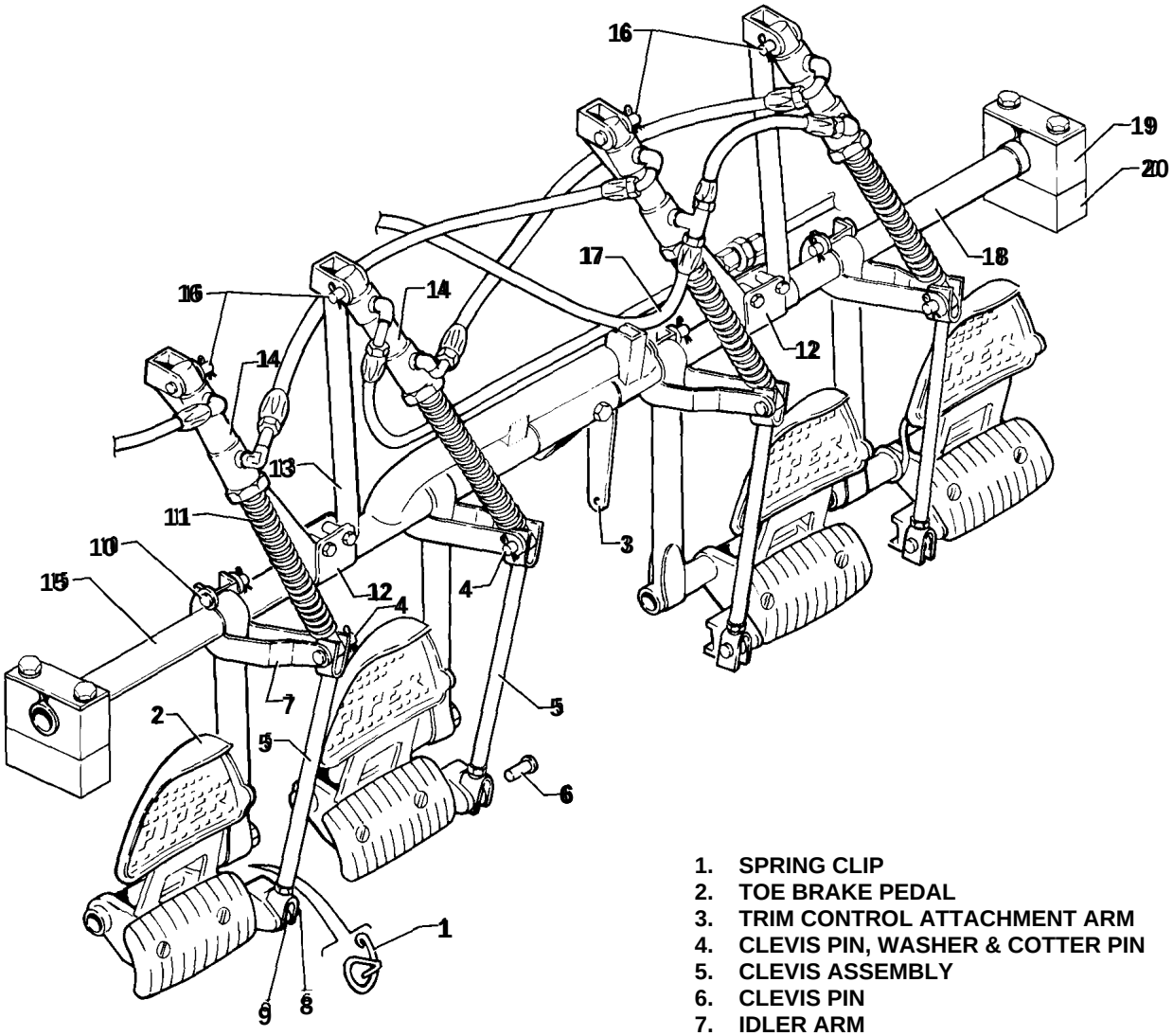
CHART 2704. TROUBLESHOOTING RUDDER TRIM CONTROL SYSTEM

Trouble	Cause	Remedy
Trim control knob moves with excessive resistance.	System not lubricated properly.	Lubricate system.

B.RUDDER AND STEERING PEDAL ASSEMBLY

1. **Removal Of Rudder and Steering Pedal Assembly** (Refer to Figure 27-13.)

   a. Remove access panel to the aft section of fuselage.
   b. Relieve rudder and stabilator cable tension by loosening one of the rudder and stabilator cable turnbuckles in aft section of fuselage.
   c. Remove tunnel plate aft of tee bar assembly by removing rudder trim control knob, trim cover attaching screws, and trim cover. Roll back carpet from tunnel and remove tunnel plate aft of tee bar assembly by removing plate attaching screws.
   d. Disconnect stabilator control cable from low end of tee bar assembly.
   e. Remove tee bar attaching bolts (with their washers and nuts) through each side of floor tunnel. Pull lower end of tee bar aft.
   f. Disconnect control cable ends from torque tube arms by removing cotter pins, washers, nuts and bolts.
   g. Disconnect rudder trim from torque tube assembly by removing cotter pin, washers, and the bolt connecting the arm to the trim. Remove cotter pin and clevis pin from rudder trim mechanism and remove mechanism from mounting channel. Remove engine control bracket assembly screw and swing it out of the way. Disconnect alternate air cable and move aside.
   h. Disconnect steering rods at the rudder by removing nuts and bolts.
   i. Disconnect brake cylinders (low end of each cylinder rod) by removing cotter pins, washers, nut, and bolts.
   j. Disconnect vee brace(s) (two braces are used with right hand brakes) from torque tube by removing nuts, washers, and bolts holding strap bracket to vee brace.
   k. Disconnect torque tube support bracket by removing two bolts attached to the box under bracket, and the four bolts attached to forward bulkhead.
   l. Remove two bolts that extend through torque tube at the center of tube assembly over floor tunnel. Compress tubes. Remove left and right toe brake pedal assembly.
   m. Disconnect torque tube support blocks from their support brackets on each side of fuselage by removing attaching nuts, washers, and bolts.
   n. Remove trim side panels.
   o. Rotate rudder pedal bar assembly toward cabin door far enough to pull right pedal bar out. Rotate remaining assembly left and remove assembly. (Note the spacers and washers on each end and between support blocks.)



1. SPRING CLIP
2. TOE BRAKE PEDAL
3. TRIM CONTROL ATTACHMENT ARM
4. CLEVIS PIN, WASHER & COTTER PIN
5. CLEVIS ASSEMBLY
6. CLEVIS PIN
7. IDLER ARM
8. JAM NUT
9. CLEVIS PIN, WASHER & COTTER PIN
10. CLEVIS PIN, WASHER & COTTER PIN
11. RETURN SPRING
12. BRACKET
13. BRACE ASSEMBLY
14. HYDRAULIC CYLINDER ASSEMBLY
15. LEFT TUBE ASSEMBLY
16. CLEVIS PIN & COTTER PIN
17. FLEXIBLE HOSE ASSEMBLY
18. RIGHT TUBE ASSEMBLY
19. UPPER SUPPORT BLOCK
20. LOWER SUPPORT BLOCK

Figure 27-13. Rudder and Steering Pedal Assembly

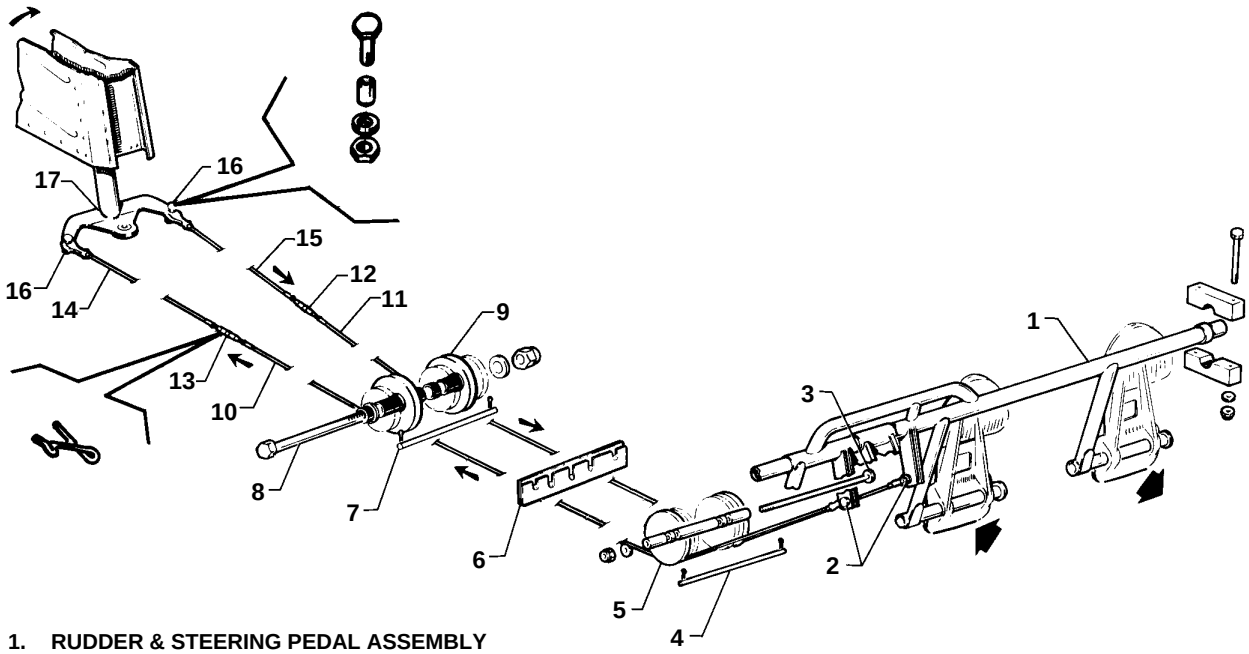
2.Installation Of Rudder And Steering Pedal Assembly (Refer to Figure 27-13.)

a. Assemble torque tube assembly per Figure 27-13. Do not at this time install the two bolts through the center of tube assembly.
b. Place upper support blocks on the ends of torque tube assembly. A washer is required on each tube end.
c. Position support blocks on their mounting brackets each side of fuselage and secure with bolts, washers and nuts. A bushing is required in the upper support block bolt holes. A plate is required on top of upper block, between upper and lower blocks, and under block mounting bracket.
d. Align bolt holes in center area of torque tube assembly. Install and tighten bolts, washers, and nuts.
e. Position torque tube support bracket on floor tunnel and secure with bolts.
f. Position vee brace(s) on torque tube. Install strap bracket around torque tube and brace, and secure with bolts, washers, and nuts.
g. Connect the ends of the brake cylinder rods and clevis rods to the idler arms. Secure with clevis and cotter pins.
h. Connect steering rods to rudder pedals and secure with bolts and nuts. Check steering rod adjustment per alignment of nose gear, chapter 32.
i. Connect rudder trim to torque tube arm. Secure with bolt, washer, nut, and cotter pin. A thin washer is under the nut which is tightened only finger tight.
j. Connect rudder control cables ends to torque tube arms. Secure with bolts, washers, nuts, and cotter pins. Allow ends to rotate freely.
k. Swing tee bar into place, secure with attachment bolts, washers, and nuts. Insert bolts through each side of floor tunnel. (See Figure 27-6.)
l. Connect stabilator control cables to lower end of tee bar with bolt, washer, and nut. Secure with cotter pin. (See Figure 27-6.) Allow cable ends to rotate freely.
m. Set rudder cable tension and check rigging and adjustment per rigging and adjustment of rudder trim controls.
n. Set stabilator cable tension and check rigging and adjustment per rigging and adjustment of stabilator controls.
o. Check aileron cable tension.
p. Check safety of bolt and turnbuckles.
q. Install floor tunnel plate and secure with screws. Fasten tunnel carpet in place.
r. Install rudder trim cover and control knob.
s. Install access to aft section of fuselage.

C. RUDDER CONTROL CABLES

1. Removal Of Rudder Control Cables (Refer to Figure 27-14.)

a. Remove access panel to the aft section of fuselage to remove the forward or aft rudder cables.
b. Disconnect cable at the turnbuckle in aft section of fuselage.
c. Remove either forward rudder cable as follows
   (1) Remove rear seat, floor panel, and front seats.
   (2) Remove cable guard pin from underside of pulley cluster in the aft area of flap torque tube.
   (3) From within the area aft of the main spar, remove block attaching screws to remove cable rub blocks attached to spar housing.



1. RUDDER & STEERING PEDAL ASSEMBLY
2. BOLT, WASHER, NUT & COTTER PIN
3. BOLT, BUSHINGS, WASHER, & NUT
4. CABLE GUARD PIN
5. PULLEY CLUSTER
6. RUB BLOCKS
7. CABLE GUARD PIN
8. BOLT, BUSHINGS, WASHER, & NUT
9. PULLEY CLUSTER
10. RIGHT FORWARD CABLE
11. LEFT FORWARD CABLE
12. LEFT TURNBUCKLE
13. RIGHT TURNBUCKLE
14. RIGHT AFT CABLE
15. LEFT AFT CABLE
16. BOLT, BUSHING, WASHER, & NUT
17. RUDDER HORN

Figure 27-14. Rudder Controls

(4) Remove rudder trim knob and cover attaching screws.
(5) Remove tunnel plate aft of tee bar by removing enough carpet from tunnel to allow plate attaching screws and plate to be removed.
(6) Remove cotter pin from the exposed end and slide it left or right to move cable guard pin, under pulley cluster aft of tee bar.
(7) Remove cotter pin, nut, washer, and bolt to disconnect the cable end from the arm on rudder pedal torque tube.
(8) Pull cable from floor tunnel.

d. Remove aft rudder control cables as follows:
(1) Remove tail cone fairing by removing attaching screws.
(2) Remove cotter pin, nut, washer, and bolt to disconnect cable from rudder horn.
(3) Pull cable through fuselage.

2. Installation Of Rudder Control Cables (Refer to Figure 27-14.)

a. Install ***forward*** rudder control cables as follows:
(1) Pull control cable through floor tunnel.
(2) Install bolt, washer, nut, and cotter pin to connect cable end to the arm on rudder pedal torque tube. (Allow cable end to rotate freely on the arm.)
(3) Connect cable to aft control cable at the turnbuckle in aft fuselage. If the aft control cables are not installed, install at this time per step b. Check each cable is in pulley groove.
(4) Move cable guard into position, in the forward area of tunnel, under pulley cluster and secure with cotter pin.
(5) Within the area aft of the main spar, install cable guard blocks onto spar housing and secure with screws.
(6) Install cable guard under pulley cluster aft of flap torque tube.
(7) Set cable tension and check rigging and adjustment per rigging and adjustment of rudder controls.
(8) Install forward tunnel plate aft of tee bar and secure with screws.
(9) Put floor carpet in place and secure.
(10)Install lower and upper selector covers and secure with screws.
(11)Install floor panel, rear seat, and front seats.

b. Install the aft rudder control cables as follows:
(1) Position control cable in fuselage.
(2) Connect cable end to rudder horn with bolt, washer, nut, and cotter pin. Allow cable end to rotate freely.
(3) Connect the other cable end to forward control cable at the turnbuckle in aft fuselage.
(4) Set cable tension and check rigging and adjustment per rigging and adjustment of rudder controls.
(5) Install tail cone fairing and secure with screws.

c. Install access panel to the aft section of fuselage.

D. RIGGING AND ADJUSTMENT OF RUDDER CONTROLS

1. Check and set correct degree of rudder travel, as follows:

— NOTE —

Raise nose wheel off of the ground when rigging the rudder. (Refer to chapter 7.)

a. Check rudder travel by swinging rudder until it contacts its stop. If control cables are connected, use rudder pedals to swing rudder.
b. With rudder against its stop, place rigging tool against the side of the rudder and vertical stabilizer as per Figure 27-15. (Make tool from dimensions given in Figure 27-18.) Check tool is not contacting rivets. If no gap exists between rigging tool and rudder surface, and vertical stabilizer, the rudder stop for one direction of travel is correct per Figure 27-17.
c. Swing rudder in the other direction and check travel as directed in step b. d.If rudder travel is incorrect (showing a gap between the tool and any part of the control surfaces), remove tail cone fairing and set stops to correct rudder travel. (Refer to Figure 27-19.)

2. Set cable tension and align rudder as follows:
   a. Remove access panel to the aft section of fuselage.
   b. Check nose gear steering is aligned and rudder pedals set fore and aft per alignment of nose landing gear, chapter 32.
   c. Clamp rudder pedals to align in lateral position per Figure 27-16.
   d. Adjust turnbuckles in aft section of fuselage for proper cable tension per Figure 27-19. Allow rudder to align at neutral position. (Determine neutral position by standing behind airplane and sighting rudder with the vertical stabilizer or stabilator trim screw center.)
   e. Check safety of turnbuckles and install all pulley guard pins.

— CAUTION —

Do not push rudder harder than necessary, to avoid cable stretch.

3. To adjust rudder pedal stops push pilot's left rudder pedal until rudder stop is contacted. Adjust pedal stop (on fire wall) to 0.060 to 0.120 inch clearance. Repeat procedure with copilot's right rudder pedal.
4. Install tail cone fairing and access panel to the aft section of fuselage.

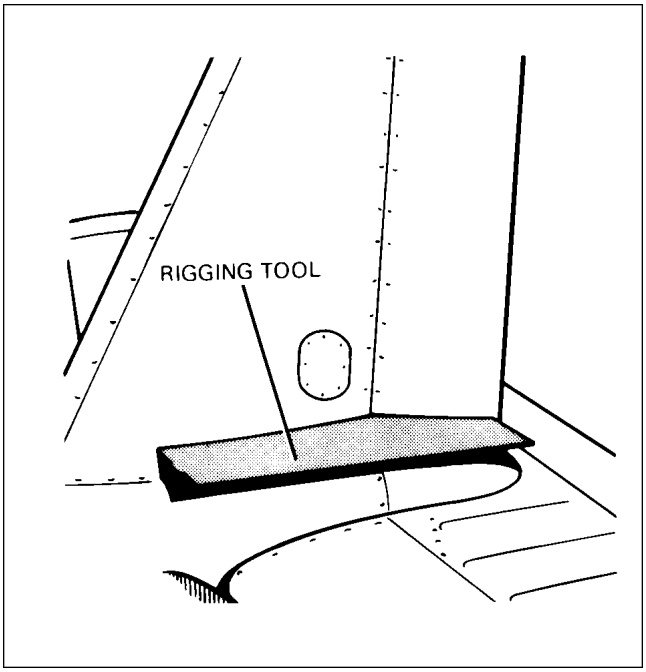


Figure 27-15. Rudder Rigging Tool

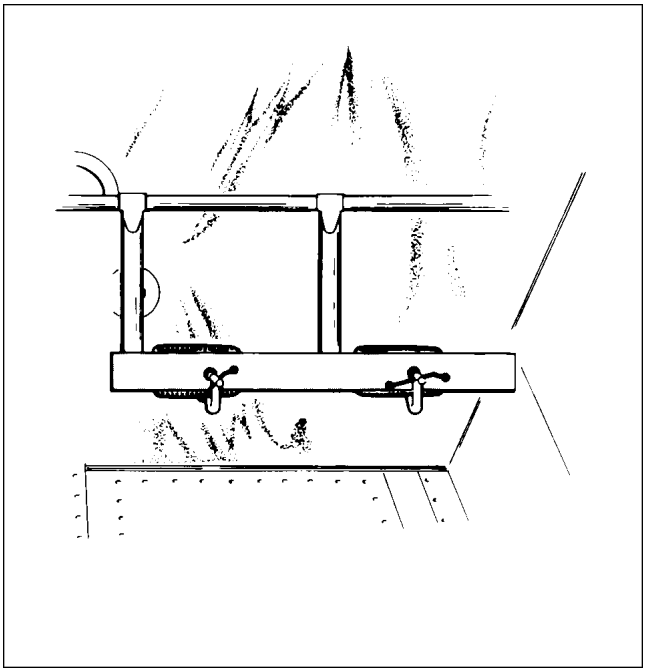


Figure 27-16. Clamping Rudder Pedals

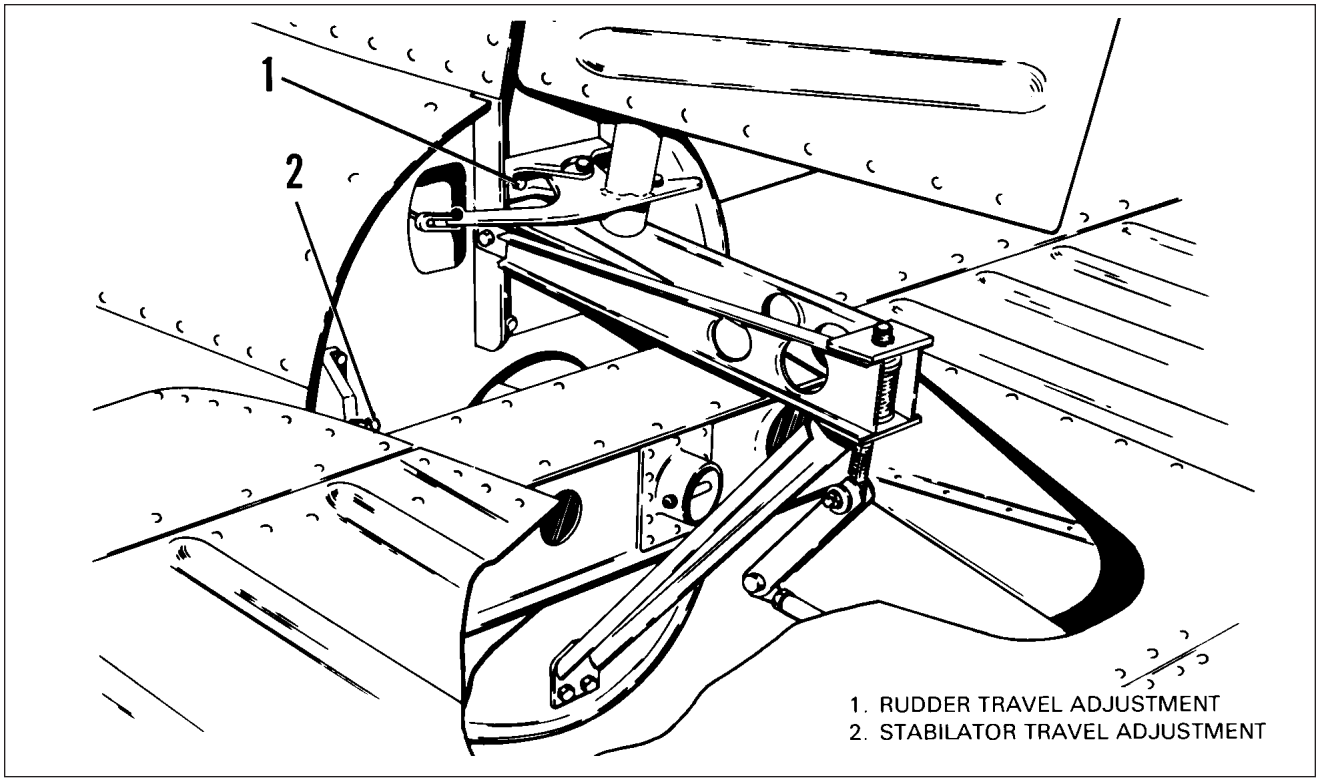


Figure 27-17. Rudder Rigging

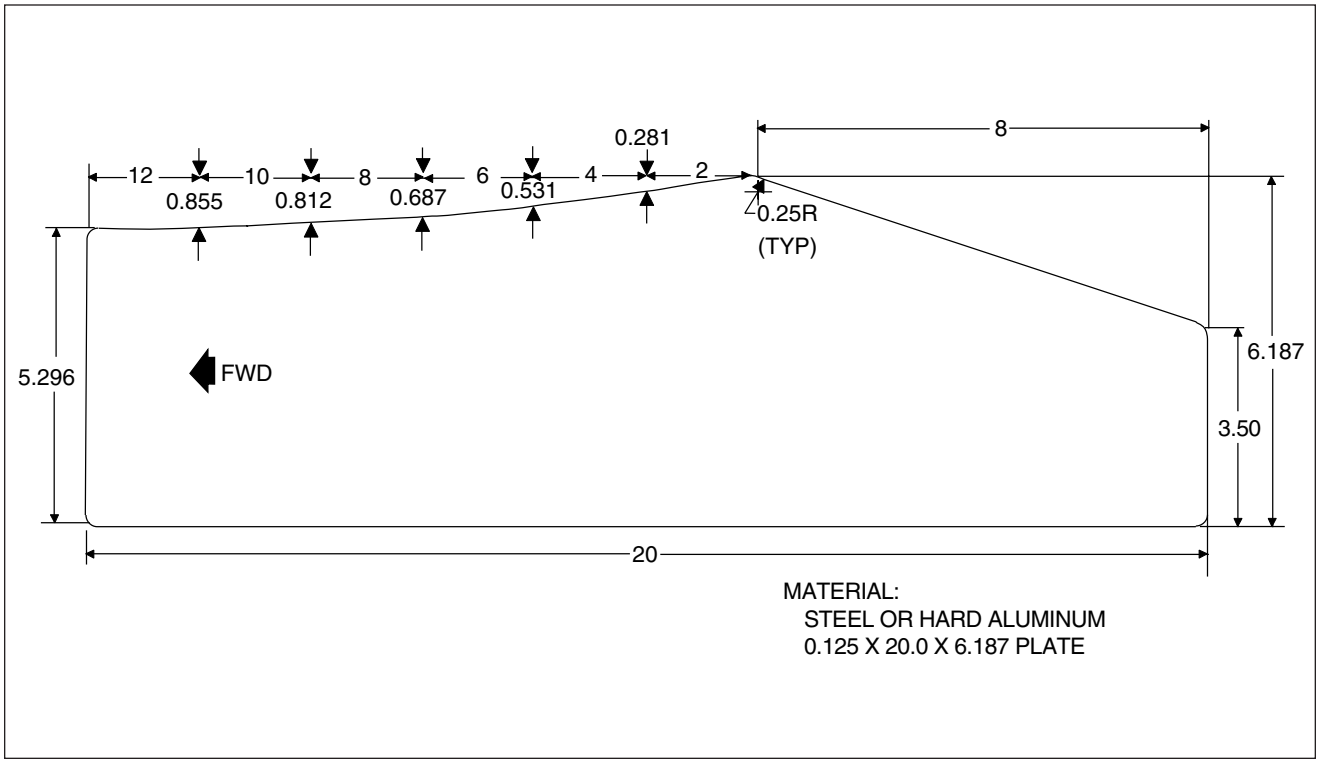
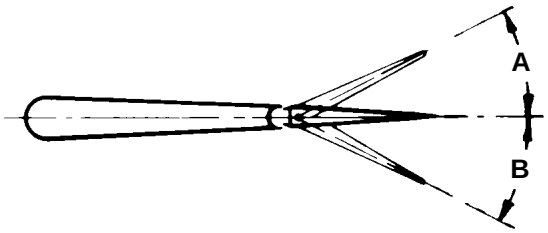


Figure 27-18. Fabricated Rudder Rigging Tool

RUDDER TRAVELS

A 27° ± 2° L

B 27° ± 2° R



CABLE TENSION

35 LB ± 5 LB

(SEE NOTE)

NOTE

CABLE TENSION APPLIES ONLY TO AIRPLANES WITH OUT AUTOPILOT BRIDLE CABLES ATTACHED. REFER TO APROPRIATE AUTOPILOT SERVICE MANUAL FOR CABLE TENSION WHEN ATTACHING BRIDLE CABLE

Figure 27-19. Rudder Travel Adjustments

E. RUDDER TRIM CONTROLS

1. Removal Of Rudder Trim Controls (Refer to Figure 27-20.)

a. Remove attaching screws to remove cover from trim control assembly.
b. Remove the rudder trim knob and cover attaching screws.
c. Rotate trim knob to the extreme left (counterclockwise) trim position.
d. Remove cotter pin, nut, washer, and bolt to disconnect housing lug from arm on rudder pedal torque tube.
e. Remove cotter pin and clevis pin to remove threaded bushing from the aft end of mounting channel. (Some mounting channels have two holes in the aft end; note from which hole the clevis pin was removed.)
f. Remove channel attaching screws at the inside of the channel to remove mounting channel.

2. Installation Of Rudder Trim Controls (Refer to Figure 27-20.)

Install rudder trim mechanism and set it at neutral (no load on spring) position. Perform the procedure only after all rudder and nose wheel rigging is complete.

a. Install trim control mounting channel on upper side of floor tunnel. A spacer plate (some models) is between channel and tunnel. Install attaching screws secured with anchor nuts.
b. Check clips are installed so safety wire is on top before attaching assembly to mounting channel. Check threaded bushing is on assembly shaft with the welded attachment bushing forward or toward housing.
c. Attach housing lug to rudder pedal torque tube arm and secure with bolt, washer, and nut. Tighten nut finger tight and safety with cotter pin.

d. Clamp rudder pedals in neutral and position threaded bushing in mounting channel. Turn control shaft until holes in bushing and channel align, and install clevis pin and cotter pin. If two through holes are in aft end of mounting channel, pin must be installed through the hole that will give equal travel and hit rudder stops before bottoming out of trim assembly.
e. With the rudder pedals neutral and no pressure fore or aft on the clevis pin, install the assembly cover so indicator washer and neutral mark on cover align.
f. Install trim cover, secure with screws, and install trim control knob.

3. Rigging And Adjustment Of Rudder Trim Controls

Perform these procedures only after all rudder and nose wheel rigging is complete. No adjustments are necessary other than those required during installation of the assembly per installation of rudder trim controls.

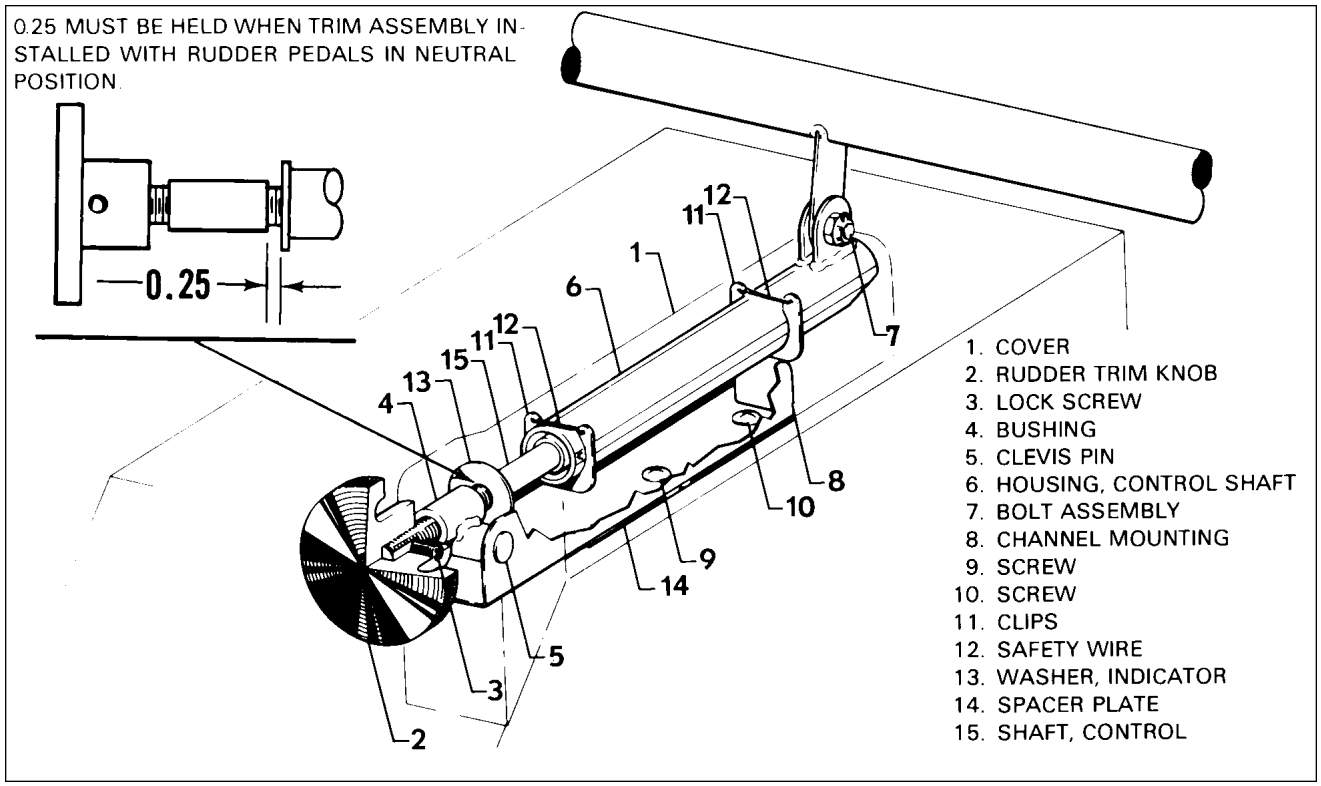


Figure 27-20. Rudder Trim Control

GRIDS 2C11 THROUGH 2C12
INTENTIONALLY LEFT BLANK

STABILATOR AND TAB

A- TROUBLESHOOTING

Charts 2704 and 2705 lists troubles peculiar to stabilator control system along with their probable causes and suggested remedies. When troubleshooting the stabilator control system, additional reference may be obtained on control surface balancing from Chapter 55. After the trouble has been corrected, check the entire rudder control system for security and operation.

CHART 2705. TROUBLESHOOTING STABILATOR CONTROL SYSTEM

Trouble	Cause	Remedy
Lost motion between control wheel and stabilator.	Cable tension too low.	Adjust cable tension.
	Linkage loose or worn.	Check linkage and tighten or replace.
	Broken pulley.	Replace pulley.
	Cables not in place on pulleys.	Install cables correctly.
Resistance to stabilator control movement.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Binding control column.	Adjust and lubricate.
	Pulleys binding or rubbing.	Replace binding pulleys and/or provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables correctly.
	Cables crossed or routed incorrectly.	Check routing of control cables.
	Bent stabilator hinge.	Repair or replace stabilator hinge.
Incorrect stabilator travel.	Stabilator stops incorrectly adjusted.	Adjust stop screws.
Correct stabilator travel cannot be obtained by adjusting stops. position.	Stabilator cables incorrectly rigged.	Rerig stabilator cables.

CHART 2706. TROUBLESHOOTING STABILATOR MANUAL TRIM CONTROL

Trouble	Cause	Remedy
Lost motion between trim control wheel and trim tab.	Cable tension too low.	Adjust cable tension.
	Cables not in place on pulleys.	Install cables properly.
	Broken pulley.	Replace pulley.
	Linkage loose or worn.	Check linkage and tighten or replace.
Trim control wheel moves with excessive resistance.	System not lubricated properly.	Lubricate system.
	Cable tension too high.	Adjust cable tension.
	Pulleys binding or rubbing.	Replace binding pulleys. Provide clearance between pulleys and brackets.
	Cables not in place on pulleys.	Install cables properly.
	Trim tab hinge binding.	Lubricate hinge. If necessary, replace.
	Cables crossed or routed incorrectly.	Check routing of control cables.
Trim tab fails to reach full travel.	System incorrectly rigged.	Check and / or adjust rigging.
	Trim drum incorrectly wrapped .	Check and/or adjust rigging.
Trim indicator fails to indicate correct trim position.	Trim indicator unit not adjusted properly.	Adjust trim indicator.

B. STABILATOR CONTROL CABLES

1. Removal Of Stabilator Control Cables (Refer to Figure 27-21.)

a. Remove access panel to aft section of fuselage in baggage compartment, two front seats, rear seats, and floor panel.

b. Disconnect control cable at the turnbuckle in the aft section of fuselage.
c. Remove either forward stabilator cable as follows:
   (1) Remove tunnel carpet and cover plate as follows:
   Remove rudder trim control knob and trim cover attaching screws. Roll back carpet from tunnel and remove tunnel plate aft of tee bar assembly by removing the plate attaching screws.
   (2) If the right (upper) stabilator control cable is to be removed, remove cotter pin guards at the pulley in the forward area of tunnel.
   (3) To disconnect cables from low end of tee bar remove cotter pin, nut, washer, and bolt.
   (4) In the access opening aft of main spar, remove cable rub blocks attached to spar housing by removing the block attaching screws.
   (5) Remove cotter pin cable guard at pulley cluster in the access opening aft of main spar.

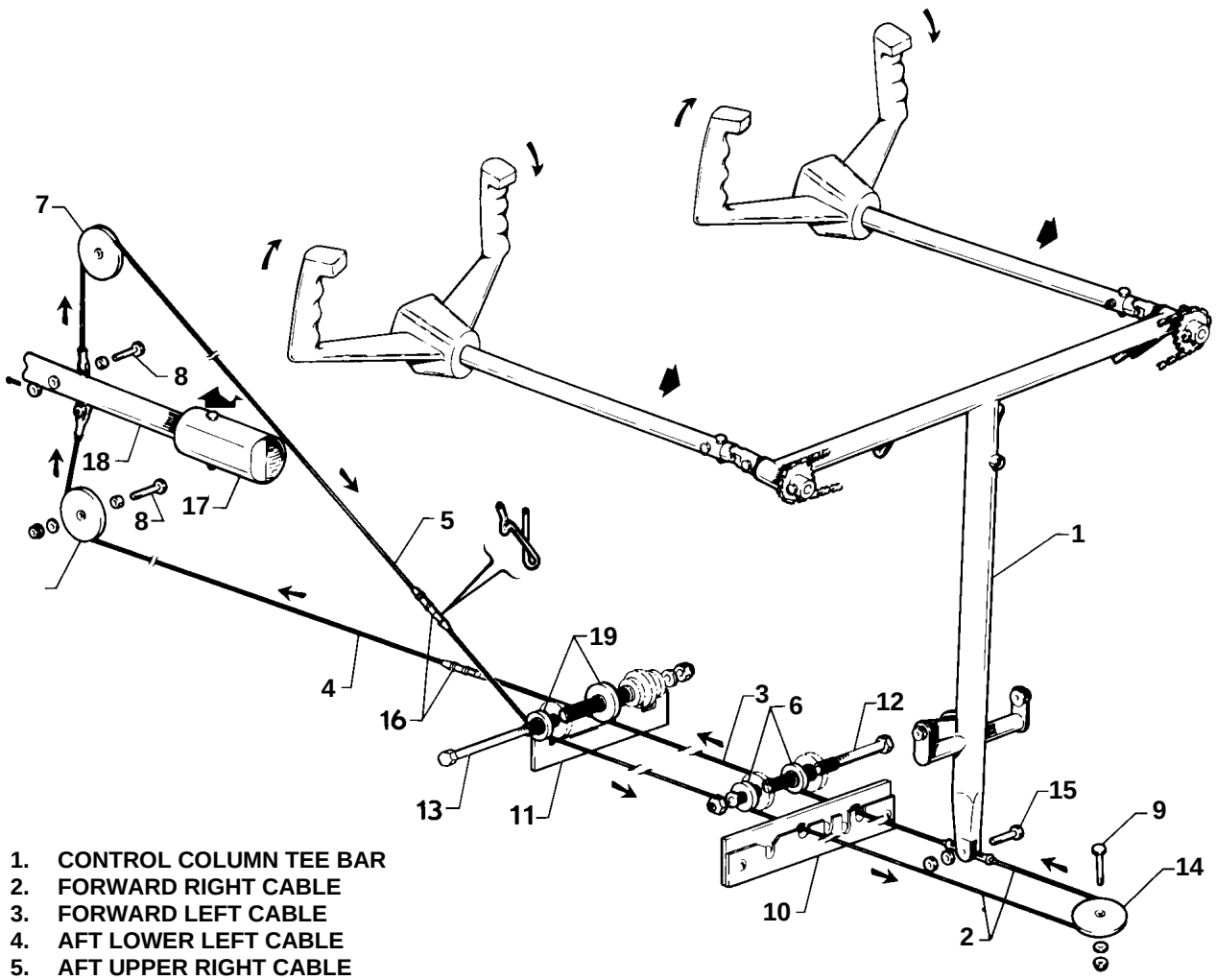
— NOTE —

Attach a line to cable end before removal to aid in control cable installation.

   (6) Pull cable aft through floor tunnel.
d. Remove either aft stabilator control cable as follows:
   (1) Remove cotter pin, nut, washer, and bolt and disconnect cable end at the stabilator balance arm.
   (2) Remove cotter pin cable guard at the pulley either above or below balance arm.
   (3) Remove cable from airplane.

2. Installation Of Stabilator Control Cables (Refer to Figure 27-21.)

a. Install forward stabilator cables as follows:
   (1) Pull control cable through floor tunnel. Check right (upper) cable is routed around pulley(s) in the forward area of floor tunnel.
   (2) Connect cables to low end of control column tee bar or idler arm with bolt, washer, nut, and cotter pin. Allow cable ends free to rotate.
   (3) Install aft control cable per step b.
   (4) Connect control cable to aft cable at the turnbuckle in aft section of fuselage.
   (5) Set cable tension and check rigging and adjustment per rigging and adjustment of stabilator trim.
   (6) For the right control cable, install the cotter pin cable guards at the pulley(s) in the forward area o the tunnel.
   (7) Within the access opening at o main spar, install cable rub blocks to spar housing and secure with screws.
   (8) Install cotter pin cable guard at the pulley cluster in the access opening.
   (9) Install floor tunnel plate and trim covers as follows:
      (a) Place tunnel plate into position and secure with attaching screws.
      (b) Roll carpet into place and install rudder trim cover and knob.
   (10) Install front seats, rear seat, and floor panel.



1. CONTROL COLUMN TEE BAR
2. FORWARD RIGHT CABLE
3. FORWARD LEFT CABLE
4. AFT LOWER LEFT CABLE
5. AFT UPPER RIGHT CABLE
6. FORWARD CLUSTER PULLEY
7. AFT PULLEY
8. BOLT, WASHER, NUT & COTTER PIN
9. BOLT, WASHER & NUT
10. CABLE RUB BLOCK
11. CABLE GUARD
12. BOLT, WASHER (7) & NUT
13. BOLT, WASHER (11) & NUT
14. FORWARD PULLEY
15. BOLT, WASHER, NUT & COTTER PIN
16. TURNBUCKLE
17. BALANCE ARM WEIGHT
18. STABILATOR BALANCE ARM
19. PULLEYS

Figure 27-21. Stabilator Controls

b. Install either at stabilator control cable as follows:
   (1) Route cable around its pulley either over or under stabilator balance arm.
   (2) Connect cable to stabilator balance arm and secure with bolt, washer, nut, and cotter pin. (Check bushing is installed with bolt.)
   (3) Connect cable to the forward cable at the turnbuckle in at fuselage. (Upper at cable connects to right forward cable and the lower cable to let cable.)
   (4) Install cotter pin cable guard at the pulley, where required.
   (5) Set cable tension and check rigging and adjustment.
   (6) Install seats and access panels.

B. RIGGING AND ADJUSTMENT OF STABILATOR CONTROLS

1. Level airplane. (Refer to chapter 8.)

— CAUTION —

Stabilator must contact both stops before control wheel contacts its stops.

2. Check and set the proper degree of stabilator travel, as follows:
   a. To check the stabilator travel, place rigging tool on upper surface of stabilator as per Figure 27-22. (Make tool per dimensions given in Figure 27-23.)
   b. Set, on a bubble protractor, the number of degree up travel as given per Figure 27-24, and place it on the rigging tool. Raise stabilator trailing edge and check protractor bubble is centered when the stabilator contacts its stops.
   c. Set, on protractor, the number of degrees down travel per Figure 27-24. Place it on the rigging tool. Lower stabilator trailing edge. Check protractor bubble is centered when the stabilator contacts its stops.
   d. If stabilator travel is incorrect in up or down position, remove tail cone fairing by removing attaching screws. Use rigging tool and bubble protractor to turn the stops at each stabilator hinge stop in or out (refer to Figure 27-24) for correct degree of travel.
   e. Check stop screw lock nuts are secure and install tail cone fairing.

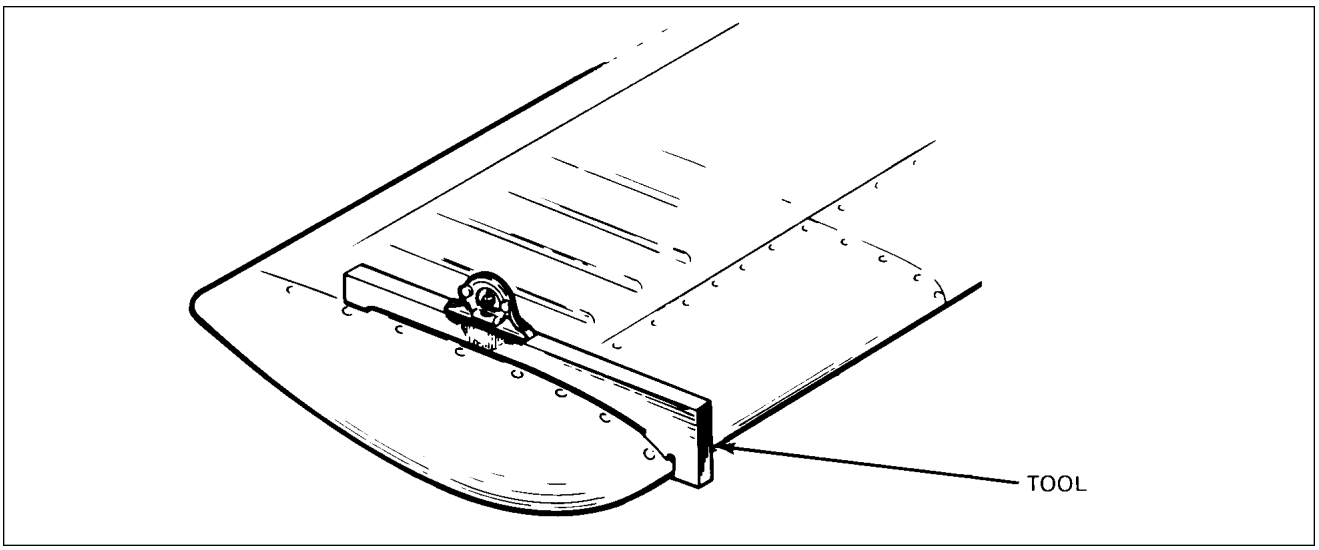


Figure 27-22. Stabilator Rigging Tool

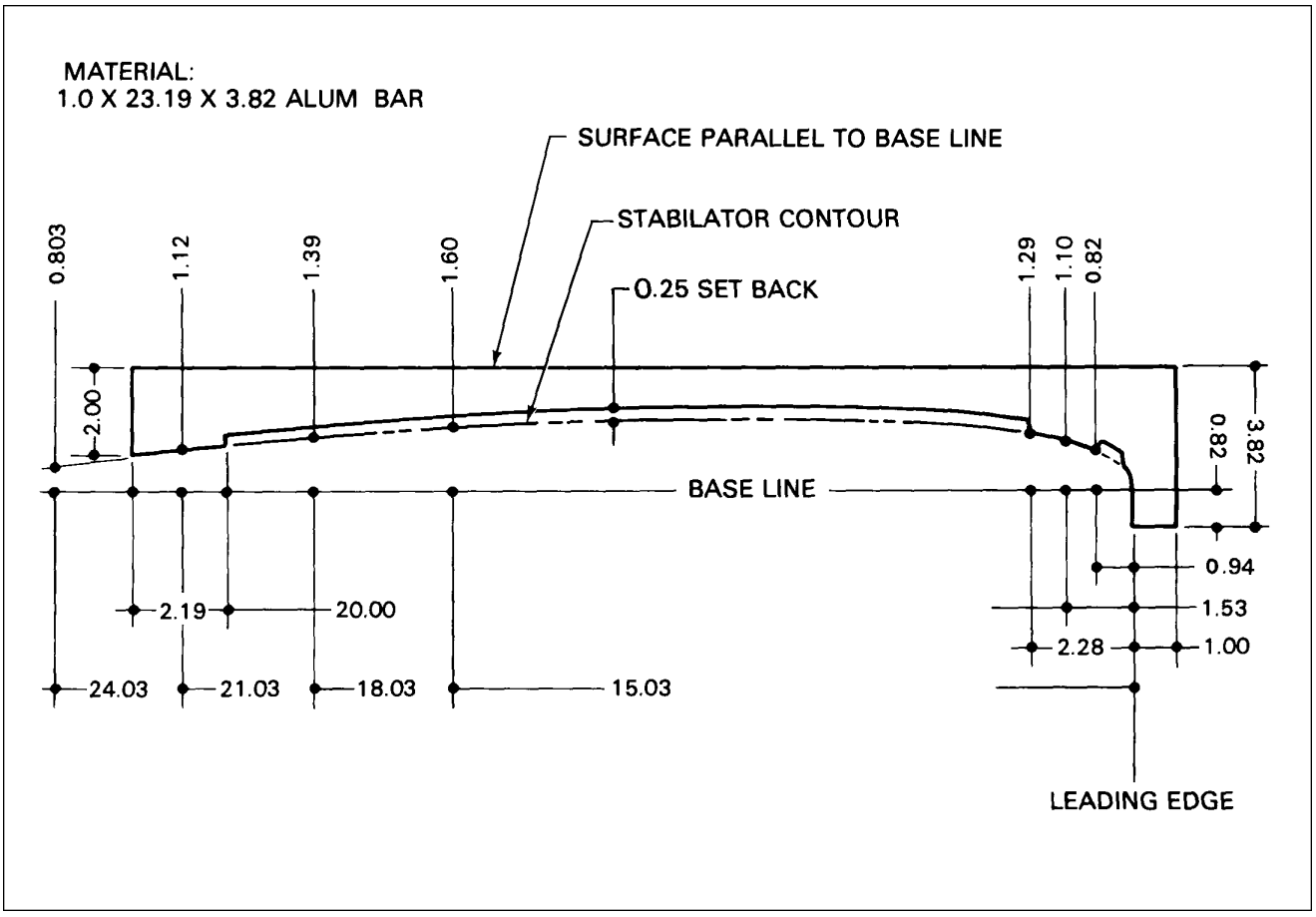


Figure 27-23. Fabricated Stabilator Rigging Tool

STABILATOR
STABILATOR TRIM TAB

A 14° ± 1° UP

B 3° ± 1° UP

C 2° ± 1° DN

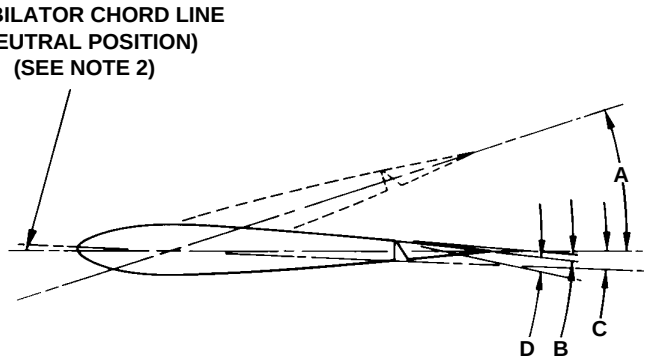
D 12° ± 1° DN

CABLE TENSION (SEE NOTE 3)

STABILATOR 50 LB ± 5 LB

STABILATOR TRIM TAB

14 LB ± 1 LB



1. MAXIMUM FREE PLAY FOR CONTROL SURFACE TAB IS 0.15 INCH MEASURED AT TAB TRAILING EDGE.
2. STABILATOR NEUTRAL POSITION IS THE STABILATOR CHORD LINE PARALLEL WITH THE TOP OF FRONT SEAT TRACKS.
3. CABLE TENSION APPLIES ONLY TO AIRPLANES WITHOUT AUTOPILOT BRIDLE CABLES. REFER TO APPROPRIATE AUTOPILOT SERVICE MANUAL FOR CABLE TENSION WHEN ATTACHING BRIDLE CABLES.

Figure 27-24. Stabilator and Trim Travel Adjustment

3. Check and set stabilator control cable tension, as follows:
   a. Check stabilator travel is correct.
   b. Remove access panel to the at section of the fuselage.
   c. Secure control column in the near forward position. Allow one-quarter inch between column and stop bumper.
   d. Check each control cable or correct tension per Figure 27-24.
   e. If tension is incorrect, loosen lower cable turnbuckle in aft fuselage and adjust the upper cable turnbuckle for proper tension. Obtain cable tension with control wheel one-quarter inch from stop and with stabilator contacting its stop.
   f. Check safety of all turnbuckles and bolts.
   g. With upper cable tension correct, and control wheel forward, adjust lower cable turnbuckle for proper tension.
   h. Check full travel of control wheel with relation to full travel of stabilator to verify stabilator contacts its stops before control wheel contacts its stops. With control wheel in the fore and aft positions, travel distance from the point where stabilator contacts its stops and control wheel contacts its stops should be approximately equal. Adjust turnbuckles if incorrect. Install all pulley guard pins.
   i. Install access panels.
4. Remove airplane from jacks.

C. STABILATOR TRIM CONTROLS

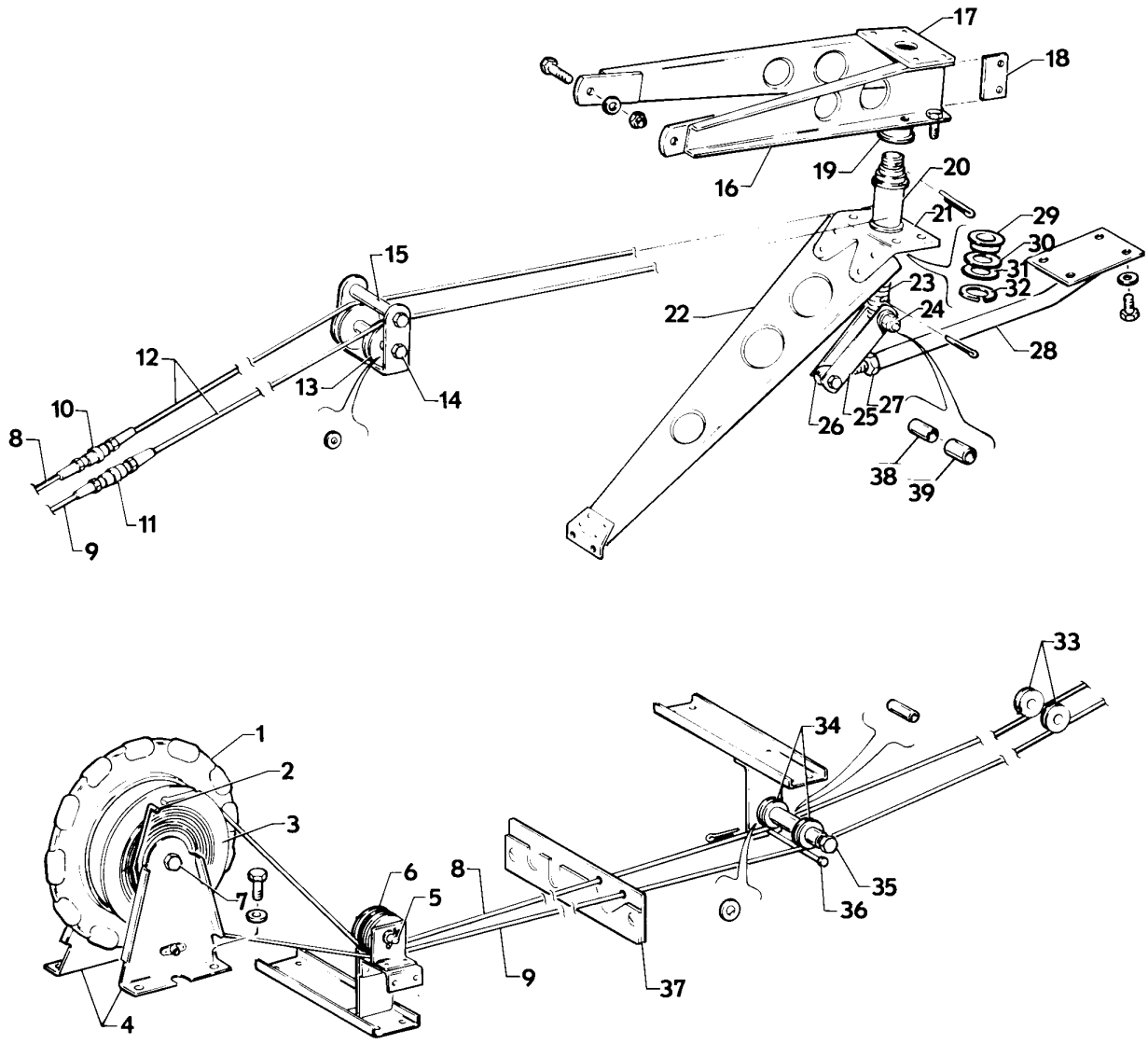
1. Stabilator Trim Assembly

a. Removal Of *Forward* Stabilator Trim Assembly (Refer to Figure 27-25.)

— CAUTION —

Do not damage trim indicator wire.

(1) To remove trim control wheel assembly and trim control cables, remove the panel to the aft section of airplane.
(2) If aft trim cable is not to be removed, block cables at the pulleys in upper aft section of fuselage to prevent unwrapping from trim drum. (Refer to Figure 27-26.)
(3) Loosen the cables if the trim control wheel is to be removed or disconnect if the cables are also to be removed. (Do this at the trim cable turnbuckles in the aft section of the fuselage.
(4) Remove control wheel and drum as follows:
   (a) Remove control wheel cover by removing cover attaching screws.
   (b) Remove wheel assembly from mounting brackets by removing nut, washer, and bolt holding wheel between brackets. (Draw wheel from brackets. Do not damage trim indicator wire.)
   (c) Unwrap left cable from drum.
   (d) Wheel and drum are joined by a push fit. Separate these two items with their center bushing and unwrap right cable.
   (e) Tie cables forward to prevent slipping into floor tunnel.
(5) Remove trim control cables as follows:
   (a) Remove rear seats, floor panel, and front seats.
   (b) Unfasten carpet from aft floor tunnel and lay it forward.



1. CONTROL WHEEL, TRIM
2. INDICATOR, TRIM POSITION
3. DRUM, TRIM CABLE
4. MOUNTING BRACKET
5. CLEVIS PIN, WASHER & COTTER PIN
6. PULLEY CLUSTER
7. BOLT, BUSHING, WASHER & NUT
8. CABLE, RIGHT FORWARD
9. CABLE, LEFT FORWARD
10. TURNBUCKLE, RIGHT
11. TURNBUCKLE, LEFT
12. CABLE, AFT
13. PULLEY CLUSTER
14. BOLT, BUSHING, WASHER (3) & NUT
15. GUARD-BOLT, BUSHING, WASHER & NUT
16. RIB, HORIZONTAL SUPPORT
17. PLATE, RIB
18. GUARD
19. BUSHING, BARREL
20. BARREL, TRIM
21. CLIP, DIAGONAL RIB
22. RIB, DIAGONAL SUPPORT
23. SCREW, TRIM
24. BOLT, WASHER (2) & NUT
25. LINK
26. ROD END
27. JAM NUT
28. ARM, TRIM CONTROL
29. BUSHING BARREL
30. WASHER, THRUST
31. WASHER, SPACER
32. SNAP RING
33. PULLEY CLUSTER
34. PULLEY CLUSTER
35. BOLT, WASHER & NUT
36. GUARD, CABLE
37. RUB BLOCK
38. TRIM LINK BUSHING
39. TRIM LINK SLEEVE

Figure 27-25. Stabilator Trim Control (Floor Control)

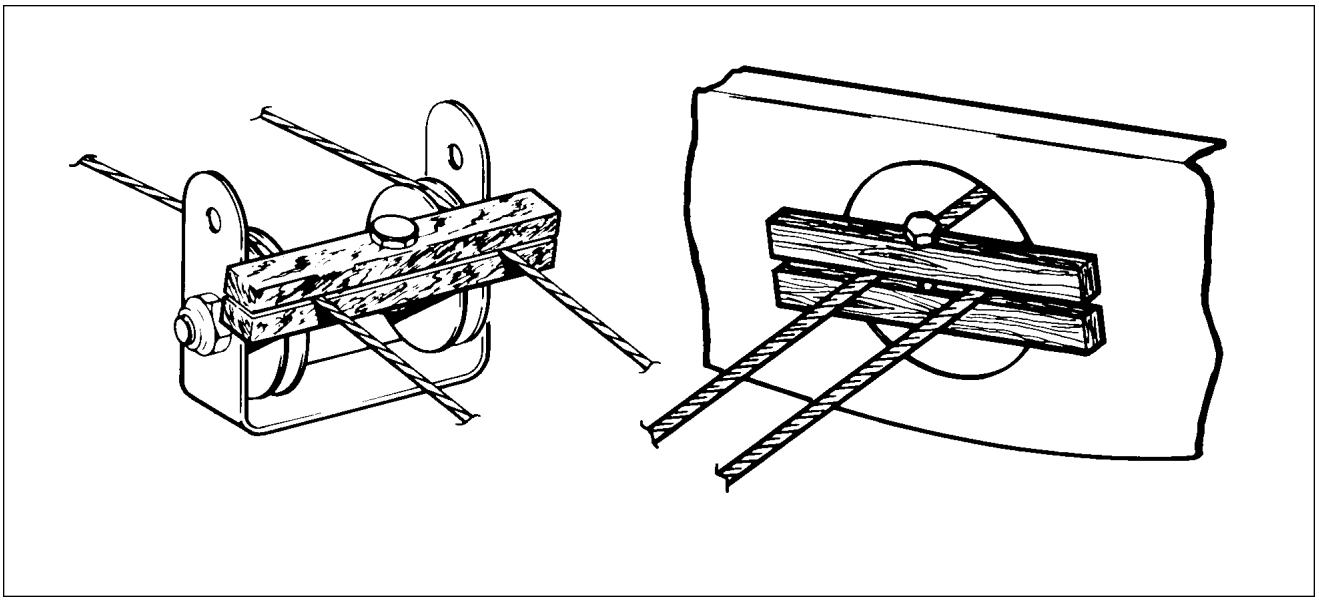


Figure 27-26. Methods of Securing Trim Cables

(c) Remove tunnel cover attaching screws. Remove tunnel cover located between trim control wheel and spar cover.
(d) Remove cable pulleys located in the tunnel by removing cotter pin, washer, and clevis pin.
(e) Remove cable rub blocks on aft side of main spar by removing cable rub block attaching screws .
(f) Remove cable guard pin at pulley cluster aft of wing flap torque tube at station 127.25.
(g) Remove nut, washer, bushing, and bolt and remove cable pulleys in aft section of fuselage at station 156.5.
(h) With cables disconnected from trim control wheel, pull cable(s) through floor tunnel.

b. Installation Of *Forward* Stabilator Trim Assembly (Refer to Figure 27-25.)

(1) Install trim control wheel with drum as follows:
(a) Wrap right trim cable on trim drum by inserting the swaged ball of cable in slot provided in the side (right side) of the drum that mates with control wheel. Wrap drum three wraps of cable in a clockwise direction.
(b) Align the long lug of drum with long slot of wheel and push together to attach control wheel to cable drum.
(c) Wrap left trim cable on drum by inserting the swaged ball of cable in slot provided in the flanged side (left side) of drum and looking at this side, wrap drum with three wraps of cable in a clockwise direction.
(d) Lubricate and install bushing in control wheel and drum.
(e) Align control cables and position control wheel assembly between mounting brackets. Check end of trim indicator wire is positioned in the spiraled slot of the drum with no bind on the end. Install retainer bolt from left side and install washer and nut.
(f) Install cover over control wheel and secure with screws, unless control cables have yet to be installed.

(2) Install trim control cables as follows:
  (a) Pull cable(s) through floor tunnel.
  (b) Wrap cable drum and install trim control wheel per step (1).
  (c) Position cable pulleys on mounting bracket in floor tunnel and install clevis pin, washer, and cotter pin.
  (d) Connect cable to the aft cable at turnbuckle in the aft section of fuselage. Install aft cable if not already installed.
  (e) Install pulleys in aft lower section of fuselage at station 156.5 forward of cable turnbuckles.
  (f) Remove blocks holding aft trim cable and check cables are seated on their pulleys.
(3) Set cable tension and check rigging and adjustment per rigging and adjustment of stabilator trim. Check safety of all turnbuckles.
(4) Install cable guard at underside of the pulleys aft of flap torque tube at station 127.25, and secure.
(5) Install cable rub blocks on aft side of main spar housing and secure with screws.
(6) Install tunnel cover on tunnel and secure with screws.
(7) Install carpet over floor tunnel.
(8) Install cover over trim control wheel and secure with screws and special washers.
(9) Install floor panel and seat belt attachments aft of main spar and secure panel with screws.
(10) Install panel to aft section of airplane and install seats.

c. Removal Of *Aft* Stabilator Trim Assembly (Refer to Figure 27-25.)

(1) Remove access panel to aft section of fuselage.
(2) Block trim cables at the first set of pulleys forward of cable turnbuckles in aft fuselage per Figure 27-26.
(3) Disconnect cable at the turnbuckles in aft section of fuselage.
(4) Remove tail cone attaching screws and remove tail cone.
(5) Remove nut, washer, bolt, bushing, and sleeve connecting link to screw, and dis- connect link between trim screw and trim control arm.
(6) Remove cotter pin from top of screw, and turn screw down and out of barrel.
(7) Remove snap ring, washer, and thrust washer from bottom of barrel.
(8) Remove the four attaching nuts, washers, and bolts and disconnect the diagonal rib from horizontal rib that supports the trim assembly.
(9) Pull trim cable from fuselage.

d. Installation of *Aft* Stabilator Trim Assembly (Refer to Figure 27-25.)

(1) Wrap trim barrel as follows:
  (a) Lay center (as measured equally from each end to center of cable) of trim cable in barrel slot.

— NOTE —

Wrap cable evenly to obtain 23 wraps on barrel, as viewed from side opposite slot, and with cables extending out from slotted side.

  (b) Bring upper cable through diagonal slot in flange at upper end of barrel, and wrap down in counterclockwise direction.
  (c) Bring lower cable through diagonal slot in lower end of barrel, and wrap up in clockwise direction.

(2) Clamp cables between two pieces of wood to prevent unwrapping.
(3) Check barrel bushings are installed in rib plate and clip.
(4) Lubricate bushings and install trim barrel in the bushings between the two support ribs. Attach bottom diagonal rib to horizontal rib and secure with bolt, washers, and nuts.
(5) Install thrust washer, washer, and snap ring on low end of barrel.
(6) Install trim screw in barrel and secure each end with cotter pin through the screw.
(7) Attach link between trim screw and trim control arm. Check bushing and sleeve are in place before installing bolt, washer and nut.
(8) Route cables into fuselage and attach ends to forward trim cables.
(9) Remove blocks holding forward cables tight and holding aft cables at barrel.
(10) Set cable tension and check rigging and adjustment per rigging and adjustment of stabilator trim. Check safety of all turnbuckles and install pulley guard pins.
(11) Install tail cone and secure with screws.
(12) Install access panel to aft section of fuselage.

2. Rigging And Adjustment Of Stabilator Trim (Refer to Figure 27-25.)

a. Level the airplane. (Refer to leveling, chapter 8.)
b. Check for proper stabilator trim cable tension per Figure 27-24. If cables were disconnected, rotate control wheel several times for cables to seat. Check cable tension.
c. Set stabilator in neutral position. (To find neutral, place rigging tool on upper surface of stabilator per Figure 27-22. Zero a bubble protractor,place it on rigging tool and tilt stabilator to center bubble.)
d. With stabilator centered, turn trim wheel until aft end of right trim cable turnbuckle is approximately two inches forward of double pulleys at top of rear bulkhead station 228.3.
e. Check trim screw is turned down until cotter pin stop (in the top of the screw) contacts plate on horizontal support rib of trim assembly. (If the stop is not contacting plate, the links between the screw and trim control arm are not disconnected. Disconnect the two by removing connecting nut, washers, and bolt.) With the turnbuckle at the two inch dimension from pulley, turn screw down until pin contacts plate.
f. Check rod end on tab actuating arm for approximately six threads forward of jam nut.
g. Connect links to trim screw and secure with bolt, washers, and nut.
h. Turn trim control wheel until trim tab streamlines with neutral stabilator.
i. Check protractor bubble over neutral tab and check tab travel per Figure 27-24. (Travel on the protractor is determined by taking difference between protractor reading at neutral and up, and neutral and down.) Bubble must be centered each reading with the airplane level.
j. To obtain correct travels, if incorrect, adjust by disconnecting the links at actuating arm rod end and turning the end in or out to correct travel. Reconnect links to rod end.
k. Secure jam nut on actuating arm rod end.
l. Turn trim wheel to full travel and check for turnbuckle clearance and tab indicator location.

D. STALL WARNING

The stall warning system consists of a lift detector electrically connected to a stall warning horn. As stalling conditions are approached, the lift detector activates the stall warning horn.

The lift detector is on the leading edge of the left wing. A tab will extend beyond the leading edge at the point where lift detector is mounted. With the master switch in the ON position, gently lift the tab; the stall warning horn should sound.

The electrical circuit is protected by a 5 amp STALL WARNING circuit breaker mounted in the circuit breaker panel on the lower right side of the instrument panel.

1. Removal Of Lift Detector

— CAUTION —

Master switch must be off before working on lift detector or warning horn. When installing wing, place reference marks on holding plate and wing skin.

a. Remove four screws holding plate around tab. Lift detector is fastened to the plate; remove unit from wing.
b. Mark electrical wires and terminals to aid installation. Remove electrical wires from lift detector; remove lift detector from airplane.

2. Installation Of Lift Detector

— NOTE —

Refer to Chapter 91 for electrical schematic of stall warning system

a. Attach electrical wires to their correct terminals on lift detector.
b. Position lift detector with its mounting plate on wing, so sensor blade drops down freely; secure in position with the four screws previously removed.

3. Adjustment Of Lift Detector

The lift detector switch is adjusted at the factory when the airplane is test flown, and should not require further adjustment during normal service life of the airplane. If service on the wing requires removing the switch, the following instructions will aid in proper switch positioning.

— CAUTION —

Never adjust switch by bending vane.

a. Loosen the two Phillips head screws; one on either side of vane. If stall warning sounds too late, move switch up. If stall warning sounds too early, move switch down. Tighten screws after adjustments.
b. The only way to test accuracy of the setting is to fly the airplane into a full stall condition and note speed at which the stall warning sounds. Stalls must be made with flaps up and power off. It may be necessary to make several test flights and alternate adjustments before the desired setting is obtained. The stall warning must sound not less than five mph, or more than ten mph before the stall occurs.

— END —

THIS PAGE INTENTIONALLY LEFT BLANK

FLAP CONTROLS

A. TROUBLESHOOTING

Charts 2707 lists troubles peculiar to flap control system along with their probable causes and suggested remedies. When troubleshooting the flap control system, additional reference may be obtained from Chapter 57 on control surface balancing, if required. After the trouble has been corrected, check the entire rudder control system for security and operation.

CHART 2707. TROUBLESHOOTING FLAP CONTROL SYSTEM

Trouble	Cause	Remedy
Flaps fail to extend or retract.	Control cable broken or disconnected.	Replace or reconnect control cable.
Flaps not synchronized or fail to move evenly when retracted.	Incorrect rigging of system.	Adjust flaps.

B. WING FLAPS CONTROLS

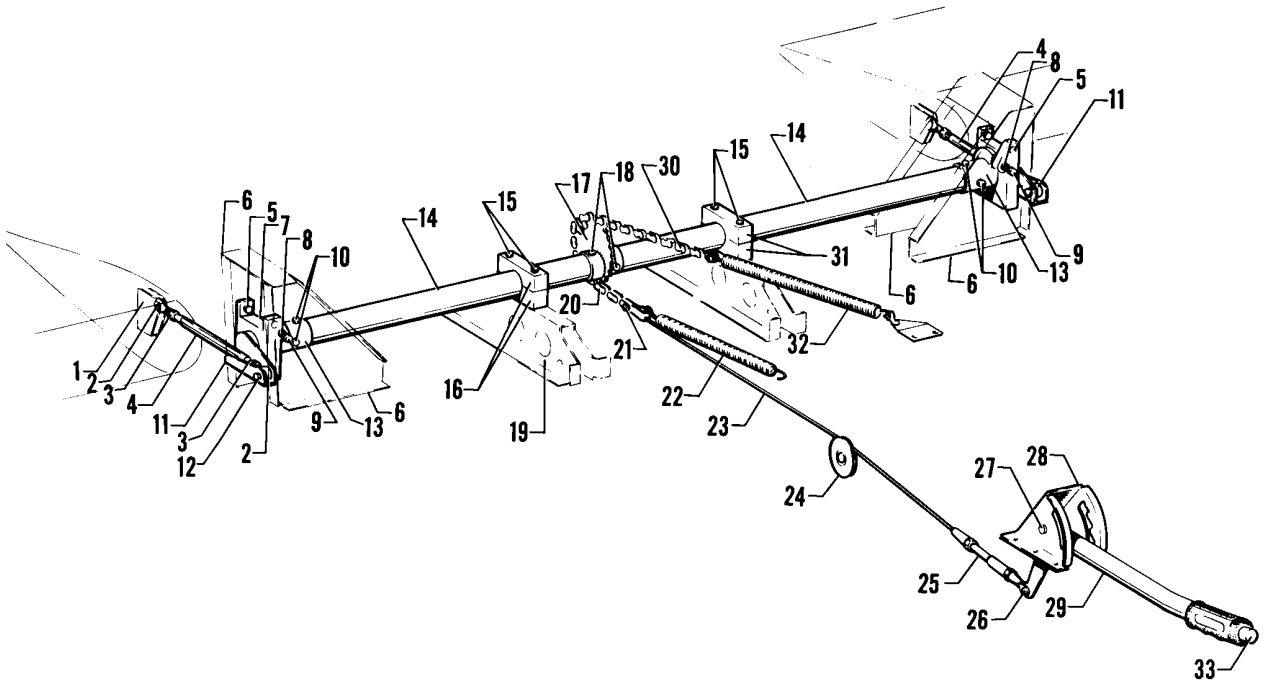
1. Removal Of Wing Flap Controls (Refer to Figure 27-27.)

a. Remove flap torque tube assembly as follows:
(1) Remove access plate between the underside of aft section of each wing and fuselage by removing attaching screws.
(2) Remove two front seats, rear seat, and floor panel.
(3) Disconnect left and right flap control tubes (rods) at the flaps by removing nuts, washers, and bolts, or at the torque tube cranks (arms) by removing the bolts and washers from inner side of each crank. Remove bolt through a hole in fuselage side skin located over the torque tube with flap handle moved to 40 degree position.

— CAUTION —

Forward pressure will be on the handle with the tension spring disconnected.

(4) With the flap handle, fully extend flaps and disconnect flap tension spring at the spar or aft end of control cable.
(5) Grasp flap handle, release plunger, and allow flap return to retracted position.
(6) Disconnect flap return spring at spar or return chain.
(7) Remove cotter pin, nut, and clevis bolt and disconnect control cable from chain.
(8) Remove block attaching bolts and remove tube support blocks.
(9) Remove nuts, washers, and bolts holding right and left cranks and stop fittings on torque tube.
(10) From between each wing and fuselage, remove cranks from torque tube.
(11) Remove nuts, washers, and bolts and disconnect one bearing block from its mounting brackets.
(12) Slide tube from bearing block still attached to its brackets, raise the end, and lift it from floor opening.



1. BRACKET, ROD ATTACHMENT
2. BOLT, WASHER & NUT
3. JAM NUT
4. ROD, FLAP CONTROL
5. BOLT, BEARING BLOCK ATTACHMENT
6. BRACKET, BEARING BLOCK
7. BLOCK, BEARING
8. NUT, LOCK
9. SCREW, FLAP ADJUSTMENT
10. BOLT, WASHER & NUT
11. CRANK (ARM), TORQUE TUBE
12. BOLT, WASHER & BUSHING
13. FITTING, TORQUE TUBE STOP
14. TUBE, TORQUE
15. BOLT, WASHER & NUT
16. BLOCK, BEARING
17. SPROCKET, TENSION SPRING
18. BOLT, WASHER & NUT
19. BRACKET, BEARING BLOCK
20. CHAIN, TENSION SPRING
21. CLEVIS BOLT, BUSHING NUT & COTTER PIN
22. SPRING, TENSION
23. CABLE, FLAP CONTROL
24. PULLEY
25. TURNBUCKLE
26. CLEVIS BOLT, NUT & COTTER PIN
27. BOLT, BUSHING, WASHER & NUT
28. BRACKET, FLAP HANDLE
29. HANDLE, FLAP
30. CHAIN, RETURN SPRING
31. BLOCK, BEARING
32. SPRING, RETURN
33. BUTTON, FLAP RELEASE

Figure 27-27. Flap Controls

b. Remove flap control cable as follows:
   (1) Remove the seats floor panel. Remove the front and rear seats.

— CAUTION —

Forward pressure will be on the handle with the tension spring disconnected.

   (2) Extend flaps to relieve spring tension and disconnect flap tension spring from cable.
   (3) Retract flap. Use care as forward pressure will be on the handle.
   (4) Remove cotter pin, nut, clevis pin, and bushing to disconnect cable from chain.
   (5) Remove flap handle bracket and cover.
   (6) Lift aft section of tunnel carpet enough to remove screws holding tunnel cover between flap handle and spar cover. Remove cover.
   (7) Remove cotter pin cable guard from flap cable pulley inside floor tunnel just ahead of spar housing.
   (8) Remove the attaching screws and remove cable rub blocks located in floor opening on aft side of spar housing.
   (9) Remove cotter pin, nut, and bolt and disconnect cable turnbuckle at flap handle. Check clevis bolt for wear. Replace bolt if worn.

c. Disconnect cable turnbuckle from handle and remove bolts holding bracket to floor tunnel. Remove flap handle and bracket.

2. Installation Of Wing Flap Controls (Refer to Figure 27-27.)

a. Install flap torque tube assembly as follows:
   (1) Install chain sprocket with chain on torque tube and secure with bolts, washers, and nuts.
   (2) Slide tube stop fittings on respective ends of torque tube.
   (3) Check one bearing block fitting is installed between its attachment brackets.
   (4) Slide the other bearing block over its respective torque tube end.
   (5) Position torque tube end with the bearing block on it between mounting bracket and slide the other end into previously attached bearing block.
   (6) Position remaining bearing block and secure with bolts, washers, and nuts.
   (7) Push torque tube cranks (arms) on each end of torque tube and slide stop fitting in place. Align crank bolt hole and stop fitting with torque tube holes and install bolts. Holes in stop fitting are elongated to allow stop fitting to be pushed against bearing blocks for no side play of assembly. Tighten bolt assemblies on stop fittings.
   (8) Install tube support blocks on support brackets and secure with bolts.
   (9) Connect flap return spring to return chain and/or at spar housing.
   (10) Connect control cable end to tension chain and secure with bushing, clevis bolt, nut, and cotter pin.
   (11) Pull flap handle full back and connect tension spring. Release flap handle to forward position.
   (12) Connect flap control tube to flap and/or torque tube crank, and secure. Install bolt and bushing (connecting control tube to crank) through a hole in fuselage side over torque tube.

b. To install flap handle with bracket, place the assembly on floor tunnel and secure with bolts.

c. Install flap control cable as follows:
   (1) Attach cable and turnbuckle to flap handle arm, secure with clevis bolt, nut, and cotter pin. Check turnbuckle end is free to rotate on arm.
   (2) Route cable through tunnel and spar housing.

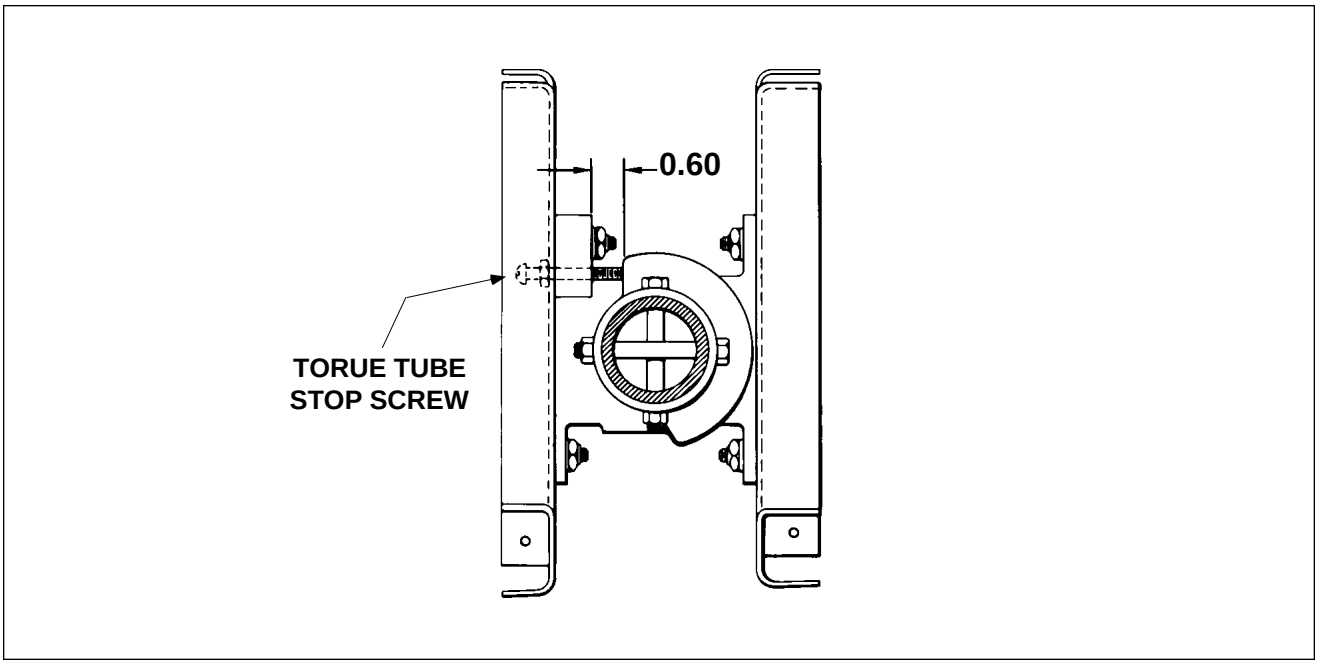


Figure 27-28 Flap Stop Adjustment

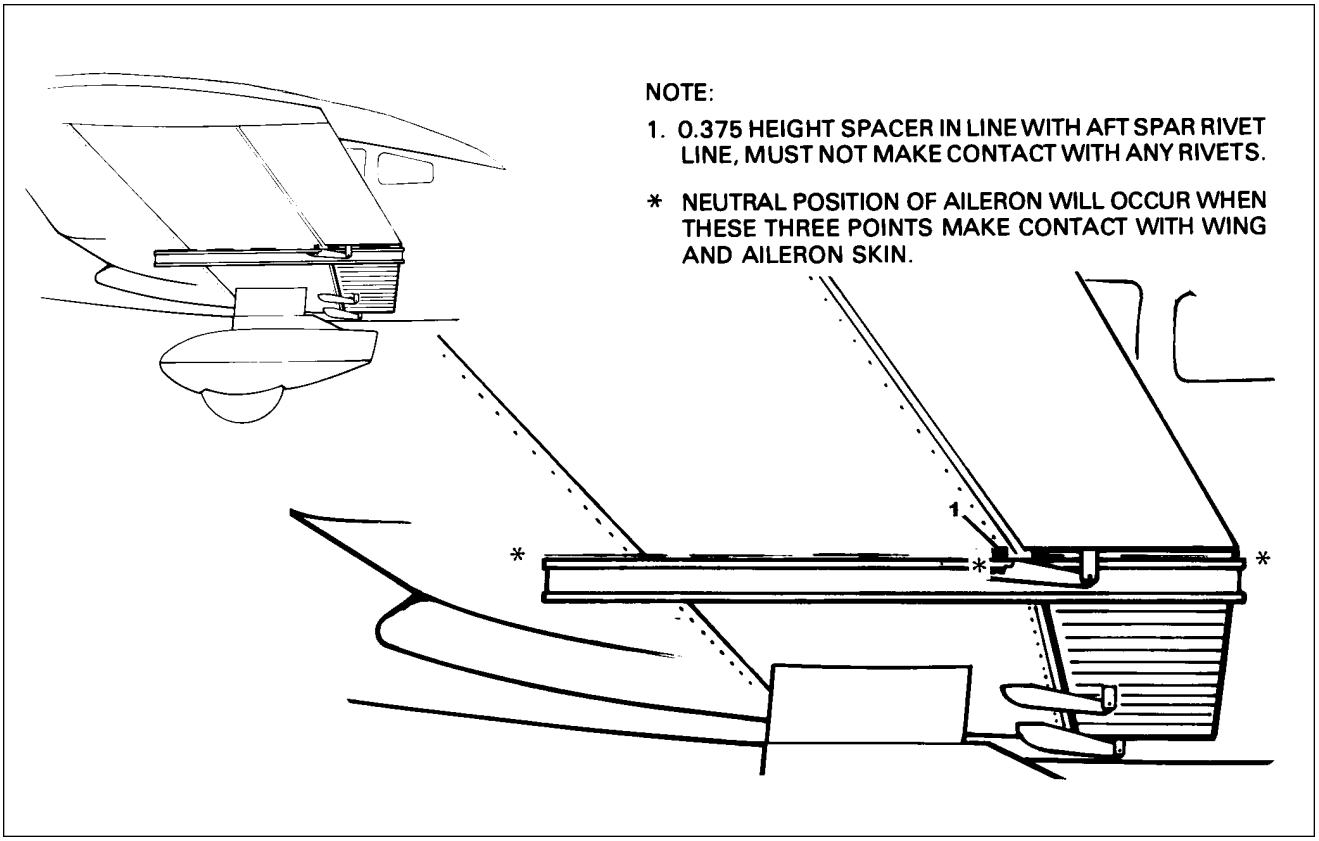

NOTE:
1. 0.375 HEIGHT SPACER IN LINE WITH AFT SPAR RIVET LINE, MUST NOT MAKE CONTACT WITH ANY RIVETS.
* NEUTRAL POSITION OF AILERON WILL OCCUR WHEN THESE THREE POINTS MAKE CONTACT WITH WING AND AILERON SKIN.
1
*
*
*

Figure 27-29. Flap Rigging Tool

(3) Install cable rub blocks on aft side of spar housing and secure with screws.
(4) Attach cable end to tension chain and secure with bushings, clevis bolt, nut, and cotter pin. (If the chain is not installed due to torque tube assembly being removed, install the assembly per step a.
(5) Pull flap handle full back and connect tension spring to cable end.
(6) Install cotter pin cable guard over pulley ahead of spar housing in floor tunnel.

d. Install tunnel cover and secure with screws. Install tunnel carpet and bracket cover.
e. Install and secure seats.

3. Rigging And Adjustment of Wing Flaps

— CAUTION —

Do not rotate torque tube while retensioning cable, or tighten enough to allow tube to be pulled away from stops.

a. Place flap handle in full forward position.
b. Remove rear seat and floor panel.
c. Adjust flap up stop and step lock as follows:
(1) Loosen jam nut of right torque tube stop screw located in floor opening along outer end of flap torque tube.
(2) Turn stop screw to approximately 0.60 inch between stop fitting and bearing block, as measured along top side of screw. (Refer to Figure 27-28) (It may be necessary to loosen left stop adjustment screw.
(3) Place a 0.125 inch spacer between stop fitting and end of screw.

— NOTE —

Check that, when down pressure is applied on flap, it stays in uplock position. If it extends, turn adjustment screw out (a few threads at a time) until flap remains in uplock position with spacer inserted.

(4) Tighten jam nut.
(5) Rotate left stop adjustment screw until it contacts stop fitting.
(6) Tighten jam nut.
(7) Set flap control cable tension (handle next to floor, 0 degrees) per Figure 27-30 at turnbuckle attached to low end of flap handle in floor tunnel. (Remove flap handle cover and enough tunnel carpet to remove tunnel cover aft of handle.)
(8) Adjust and safety turnbuckle.

d. Verify up-neutral position of flaps as follows:
(1) Place flap rigging tool per Figure 27-29 against underside of wing and flap, close as possible to outboard end of flap (Do not contact any rivets.)

— NOTE —

Position tool parallel to wing ribs, aft end of tool even with trailing edge of flap. (Make tool from dimensions given in Figure 27-10.)

(2) With flap control rod connected between torque tube crank arm and flap, check wing surface contacts tool at its forward surface and at spacer. Aft end of flap must contact aft end of tool. (The flap is neutral at this position.)
(3) If the three points do not contact, loosen jam nuts on each end of control rod and rotate until the three points contact. (Apply slight up pressure against trailing edge of flap while making this adjustment.
(4) Tighten jam nuts.
(5) Check and adjust the other flap in a like manner.

— NOTE —

To remedy a wing heavy condition during flight, adjust flap down from neutral on heavy wing, by lengthening control rod. Check each rod inspection hole to make sure there are sufficient threads remaining and that a wire cannot be inserted through these holes. Maintain a minimum of 0.375 inch thread engagement on rod ends without check holes. Do not raise the flap of the other wing above neutral.

e. Check flap for full down travel to the degrees required in Figure 27-30. Adjust torque tube stop screw in or out as necessary. After adjusting screw, review steps c (3) through d (5).
f. Check operation of the flap and flap handle ratchet mechanism.
g. Install access plates and panels.

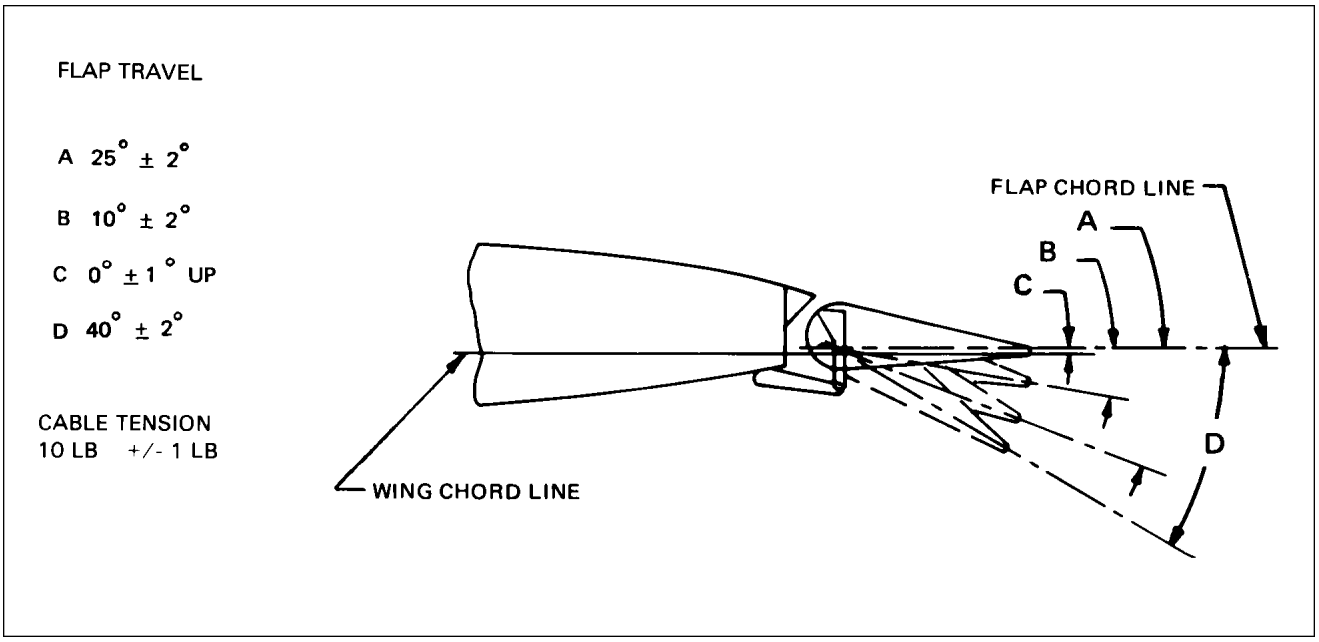


Figure 27-30. Flap Rigging

GRIDS 2D8 THROUGH 2D9
INTENTIONALLY LEFT BLANK

CHAPTER

28

FUEL

2D10

CHAPTER 28 - FUEL

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
28-00-00	FUEL SYSTEM	2D13	
28-00-00	General	2D13	
28-00-00	Description	2D13	
28-00-00	Archer II	2D13	
28-00-00	Archer III	2D13	
28-00-00	Troubleshooting	2D15	
28-10-00	STORAGE	2D19	
28-10-00	Fuel Tank	2D19	
28-10-00	Removal of Fuel Tank	2D19	
28-10-00	Inspection and Repair of Fuel Tank	2D19	
28-10-00	Installation of Fuel Tank	2D19	
28-10-00	Locking Fuel Cap	2D19	
28-20-00	Archer II	2D19	
28-10-00	Disassembly of Locking Fuel Cap	2D19	
28-10-00	Assembly of Locking Fuel Cap	2D19	
28-20-00	Archer III	2D19	
28-10-00	Disassembly of Locking Fuel Cap	2D19	
28-10-00	Assembly of Locking Fuel Cap	2D20	
28-20-00	DISTRIBUTION	2D22	
28-20-00	General	2D22	
28-20-00	Fuel Selector Valve	2D22	
28-20-00	Removal of Fuel Selector Valve	2D22	
28-20-00	Installation of Fuel Selector Valve	2D22	
28-20-00	Fuel Filter Bowl and Screen	2D22	
28-20-00	Removal of Fuel Filter Bowl and Housing	2D22	
28-20-00	Cleaning and Inspection of Filter Bowl Screen	2D22	
28-20-00	Installation of Fuel Filter Bowl and Screen	2D23	
28-20-00	Electric Fuel Pump	2D23	
28-20-00	General	2D23	
28-20-00	Removal of Electric Fuel Pump	2D23	
28-20-00	Disassembly of Electric Fuel Pump	2D24	
28-20-00	Cleaning, Inspection and Repair of Electric Fuel Pump	2E1	
28-20-00	Resistance Check (Plunger Type Pump)	2E1	
28-20-00	Assembly of Electric Fuel Pump	2E1	

CHAPTER 28 - FUEL

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
28-20-00	DISTRIBUTION (Cont.)	—	
28-20-00	Adjustment of Electric Fuel Pump (Bench Test)	2E1	
28-20-00	Adjustment of Electric Fuel Pump (In Airplane)	2E2	
28-20-00	Installation of Electric Fuel Pump	2D10	
28-20-00	Lines and Fittings	2E2	
28-20-00	Inspection and Tightening of Fuel Line Union Fittings	2E2	
28-20-00	Replacement of Fittings	2E3	
28-40-00	INDICATING	2E6	
28-40-00	Fuel Quantity Transmitter Unit	2E6	
28-40-00	Removal of Archer II and Archer III Fuel Quantity Transmitter Unit	2E6	
28-40-00	Installation of Archer II and Archer III Fuel Quantity Transmitter Unit	2E6	
28-40-00	Fuel Quantity Transmitter/Gauge Check (Installed)	2E6	
28-40-00	Archer II with A. C. Sparkplug Gauges	2E6	
28-40-00	Archer II with Stewart Warner or Rochester Gauges	2E7	
28-40-00	Archer III 28 Vdc Fuel Gauges	2E8	
28-40-00	Check and Adjustment of Fuel Quantity Transmitter Unit	2E11	
28-40-00	Archer II 14 Vdc Fuel Quantity Transmitter Check (Piper P/N 486 520)	2E11	
28-40-00	Archer III 28 Vdc Fuel Quantity Transmitter Check (Piper P/N 548 671)	2E11	
28-40-00	Fuel Quantity Indicators	2E14	

FUEL SYSTEM

A. GENERAL

—WARNING—

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

This chapter contains information on fuel tanks, selector valves, filter screens, and fuel pumps. Instructions are given for difficulties which may arise in the normal operation of the fuel system. Maintenance for carburetion is found in Chapter 71, Power Plant.

B. DESCRIPTION

—NOTE—

See chapter 12 for anti-icing fuel additives information.

1. Archer II

The Archer II is equipped with aluminum fuel tanks; one in the inboard leading edge section of each wing. Each tank has a 25 gallon capacity. A strainer is installed in the fuel outlet of each tank. A fuel line from the tank outlet is routed through the wings to the fuel selector valve which is located on the left side of cabin in front of pilot's seat. A line from the fuel selector valve leads to the fuel strainer bowl located on left forward face of firewall.

On S/N's 28-7690001 through 28-7990589, a fuel line is routed from the strainer bowl, through the engine driven fuel, pump to the carburetor inlet port. A tee in the fuel line upstream of the engine driven pump routes fuel through the electric fuel pump to a tee in the fuel line downstream of the of the engine diven pump, thus bypassing the engine driven pump. (Refer to Figure 28-1)

On S/N's 28-8090001 through 28-8690056, and 2890001 through 2890205, a fuel line is routed from the strainer bowl to the electric fuel pump, through the engine driven fuel pump, to the carburetor inlet port. Thus, the electric fuel pump is in line with the engine driven punp. (Refer to Figure 28-1)

A manual primer system, utilizing a hand pump, is incorporated into the system for cold engine starting. When the pump lever is withdrawn and pushed in, liquid fuel is pumped through the gascolator direct to the two front cylinders and to the left rear cylinder.

Two electrical fuel quantity gauges are mounted on the instrument panel cluster. Each gauge is connected to a transmitter unit in the fuel tanks.

2. Archer III (Refer to Figure 28-2)

The Archer III is equipped with two aluminum fuel tanks; one in the inboard leading edge section of each wing. Each tank has a 25 gallon capacity. A strainer is installed in the fuel outlet of each tank. A fuel line from the tank outlet is routed through the wings to the fuel selector valve which is located on the left side of cabin in front of pilot's seat. A line from the fuel selector valve leads to the fuel strainer bowl located on left forward face of firewall. A fuel line is routed from the strainer bowl to the electric fuel pump, engine driven fuel pump, and then to the carburetor inlet port.

The electric fuel pump is installed on the left forward side of the firewall. The outlet port on the pump is equipped with a tee. One side of the tee is routed through the engine driven pump to the carburetor The other side of the tee is routed through the primer solenoid valve (clamped to the left side engine mount) to cylinders 1, 2, and 4. In the event of engine driven fuel pump failure, the electric fuel pump can be activated continuously by an ON-OFF rocker type FUEL PUMP switch located in the overhead switch panel

The electric fuel primer system may be used for cold engine start. A push ON, spring loaded OFF primer (PRIME) switch, located adjacent to the starter (START) switch on the overhead switch panel, is used to activate the system. When pushed and held in, the switch activates a relay, which bypasses the FUEL PUMP switch, and operates the electric fuel pump. At the same time, a solenoid valve is opened electrically, permitting liquid fuel to be pumped directly to cylinders 1, 2, and 4.

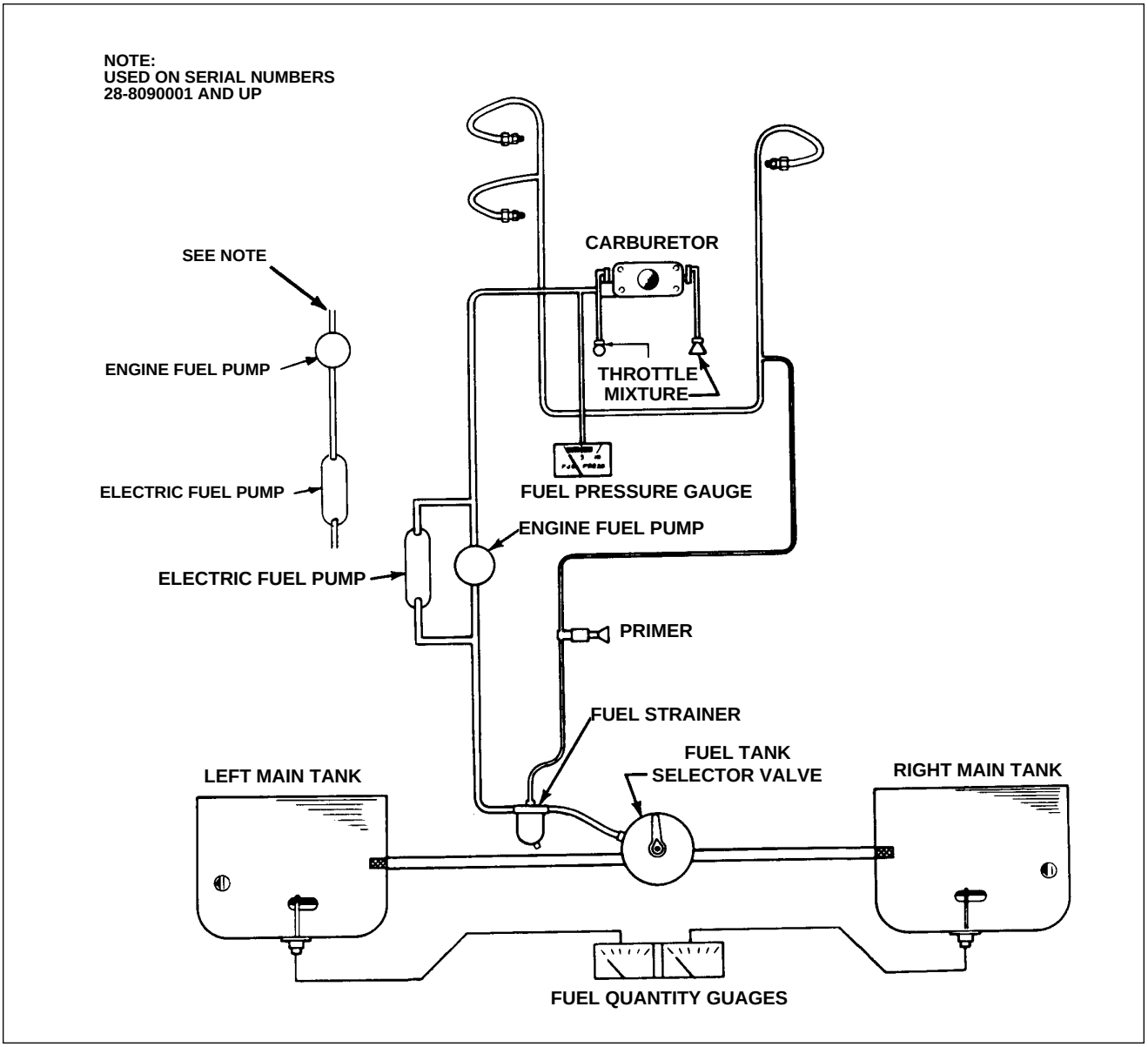


Figure 28-1. Archer II Fuel System Diagram

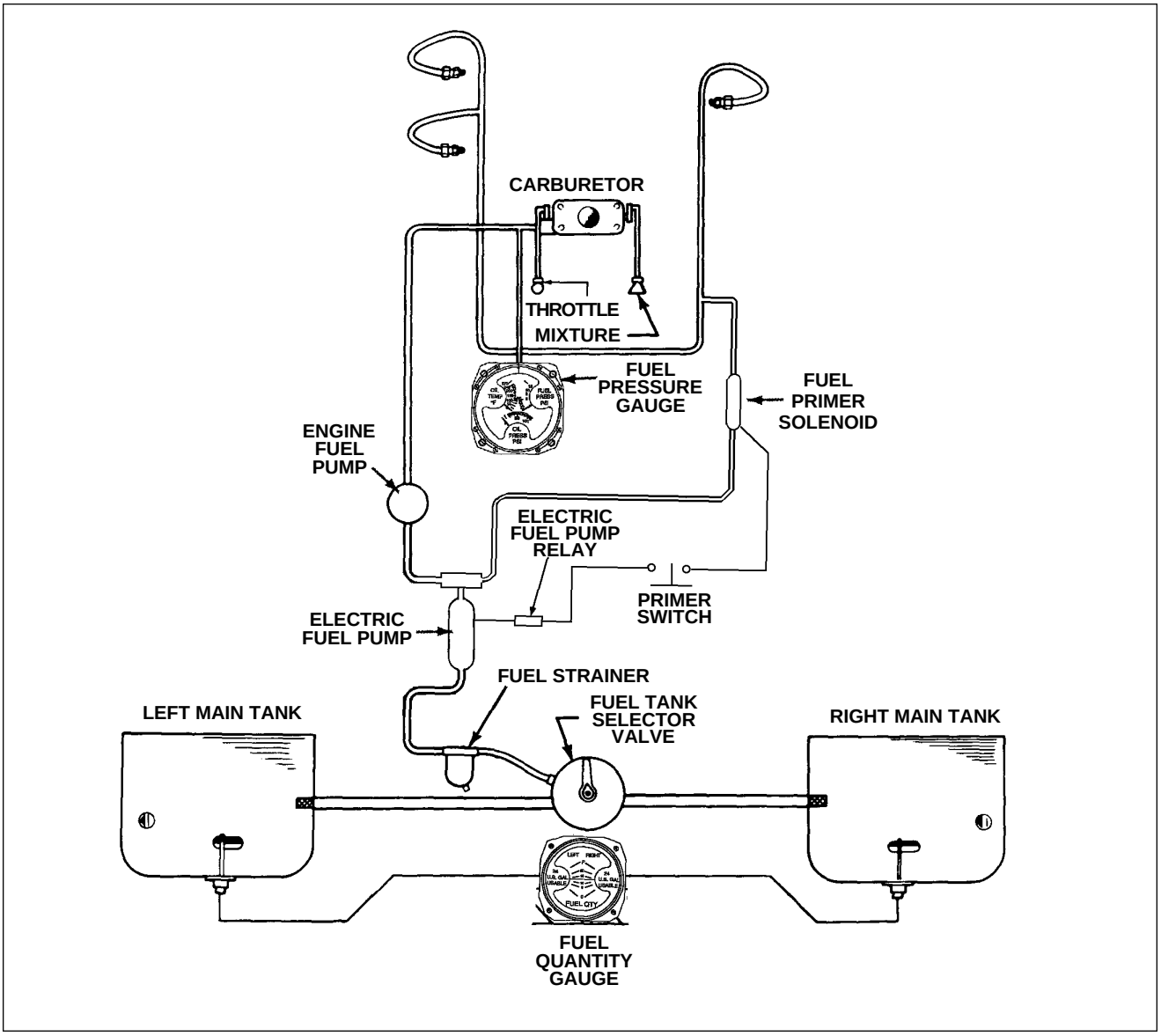


Figure 28-2. Archer III Fuel System Diagram
(S/N's 2890206 and up)

C. TROUBLESHOOTING

Troubles peculiar to the fuel system are listed in chart 2801 along with probable causes and remedies. When troubleshooting, check from the power supply to the item affected. If no trouble is found from this method, the trouble may be in the individual pieces of equipment. Remove and replace faulty equipment.

CHART 2801. TROUBLESHOOTING FUEL SYSTEM (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
Fuel will not flow.	Blocked in fuel line.	Flush fuel system.
	Blocked cap vent.	Check and clean cap vent hole.
	Mechanical or electric fuel pump failure.	Check and replace if necessary.
	Fuel selector not in proper position.	Check selector position and adjust if required.
	Fuel selector valve damage.	Replace fuel valve.
Fuel gauge failure.	Broken wire.	Check and repair.
	Gauge inoperative.	Replace.
	Fuel inside float.	Replace float.
	Circuit breaker open or fuse blown.	Check and set or replace.
	Incomplete ground.	Check ground connections at fuel transmitter in wings.
	Float and arm assembly of fuel transmitter in wing sticking.	Check fuel transmitter in wings and repair or replace.
Fuel gauge reads full when tanks are not full.	Complete ground on transmitter wire.	Check ground connections at fuel transmitter in wings.
No fuel pressure reading.	Fuel valve stuck.	Check valve.
	No fuel in tanks.	Check fuel level and fill.
	Defective fuel pump.	Check pump for pressure build up. Check diaphragm and relief valves in engine pump. Check for obstructions in electric pump. Check bypass valve. Check for air leak in intake lines.

CHART 2801. TROUBLESHOOTING FUEL SYSTEM (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
No fuel pressure reading. (cont.)	Defective gauge.	Replace gauge.
	Fuel selector not in proper position.	Check selector position and adjust if required.
Pressure low or pressure surges.	Obstruction in pump inlet side.	Trace lines and locate obstruction.
	Faulty bypass valve.	Replace.
	Faulty diaphragm.	Replace or rebuild pump.
Unidentified leak.	Fuel line damaged or improperly installed.	Locate and repair or tighten.
Fuel valve leaks.	Worn O-rings	Replace O-rings or valve.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

STORAGE

A. FUEL TANK

1. Removal Of Fuel Tank

a. Drain fuel from fuel tank. (Refer to chapter 12.)
b. Remove tank assembly screws.
c. Remove access panel at WS 54.00 and disconnect fuel line attached to tank.
d. Pull tank from wing assembly enough to remove sender wire.
e. Remove tank.

2. Inspection And Repair Of Fuel Tank

Inspection and repair of fuel tanks is limited to inspecting for dents and leaks.

3. Installation Of Fuel Tank

a. Slide tank into position and connect sender wire.
b. Slide tank completely into position and attach fuel line.
c. Install and tighten screws around fuel tank.
d. Fill fuel tank and check for leaks, unrestricted fuel flow, and proper quantity gauge readings. Refer to fuel quantity sender/gauge check (installed).
e. Position access plate and secure with screws.

B. LOCKING FUEL CAP

1. Archer II

a. Disassembly Of Locking Fuel Cap (Refer to Figure 28-3.)

(1) Remove two screws on the back of fuel cap.
(2) Remove screw holding pawl to the back of key lock assembly.
(3) Remove pawl from the back of key lock assembly.
(4) Remove nut holding key lock to cover. ‘
(5) Slide lock, gasket, and spring over the back of key lock.
(6) Push key lock through cover and remove key lock.

b. Assembly Of Locking Fuel Cap

(1) Insert key lock through the cover, verify O-ring is installed under the key lock head.
(2) Slide spring, gasket, and lock over the back of key lock.
(3) Install the nut holding key lock to cover.
(4) Attach pawl to the back of lock assembly with screw. Use Loctite 271 on screw.
(5) Install two screws on the back of fuel cap. Use Loctite 271 on screws.

2. Archer III Flush Type Cap

a. Disassembly Of Locking Fuel Cap (Refer to Figure 28-4.)

(a) Remove the two screws from top of fuel cap.
(b) Remove screw and lock washer that secures pawl to bottom of key lock. Remove pawl.

(c) Remove nut that secures key lock to cover.
(d) Slide lock, gaskets, and spring over back of key lock.
(e) Remove key lock by pushing keylock through cover. Ensure that the O–ring is not lost.

b. Assembly Of Locking Fuel Cap

(a) Insert key lock through cover. Make sure that O–ring gasket is installed under head of key lock.
(b) Slide spring, gaskets, and lock over back of key lock.
(c). Install nut that secures key lock to cover.
(d) Apply loctite #211 or #680 to screw threads primed with locquic “N” or “T”. Attach pawl to back of lock assembly with screw and lock washer.
(e) Apply a thin coating of PR-1422 sealant to shank and thread of the screws removed from top of cap. Install screws and lockwashers on top of fuel cap.

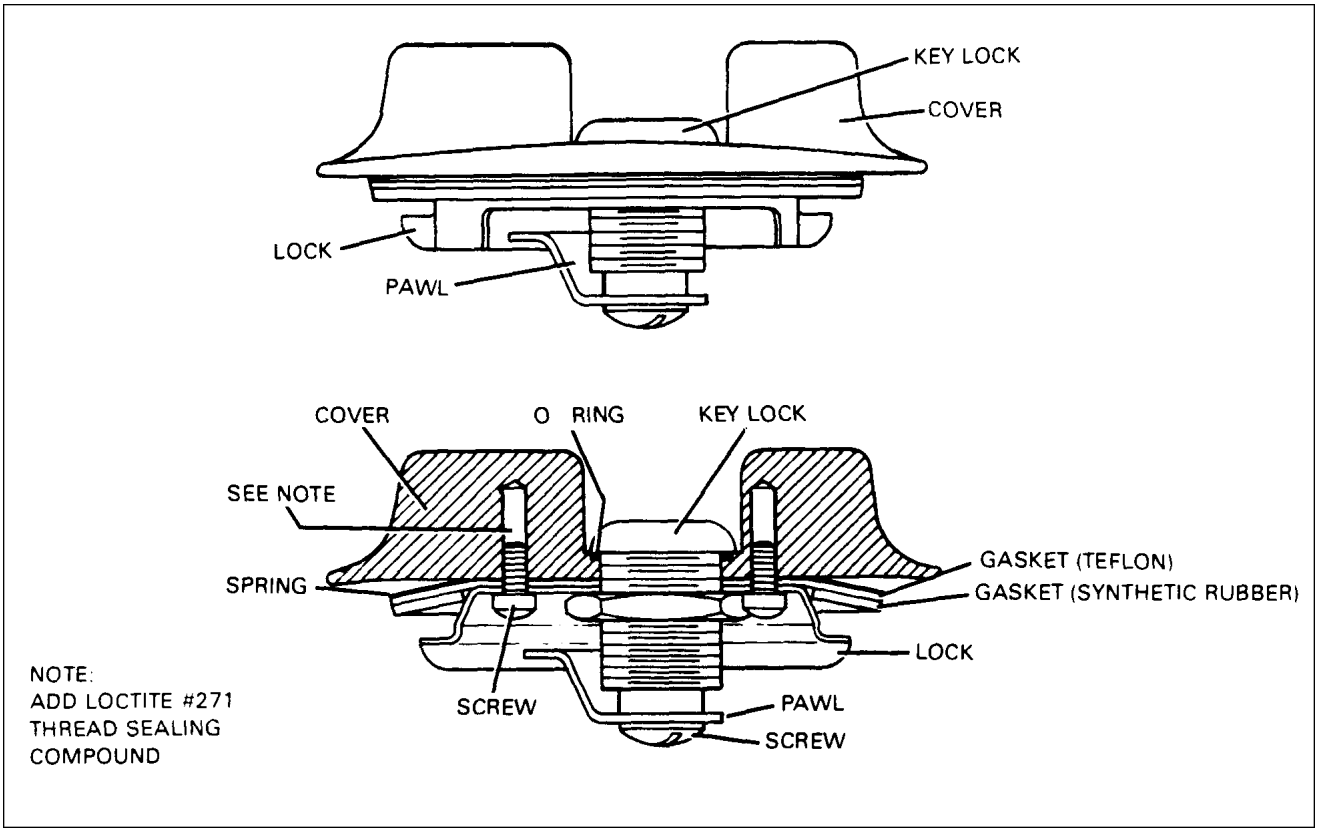


Figure 28-3. ArcherII Locking Gas Cap

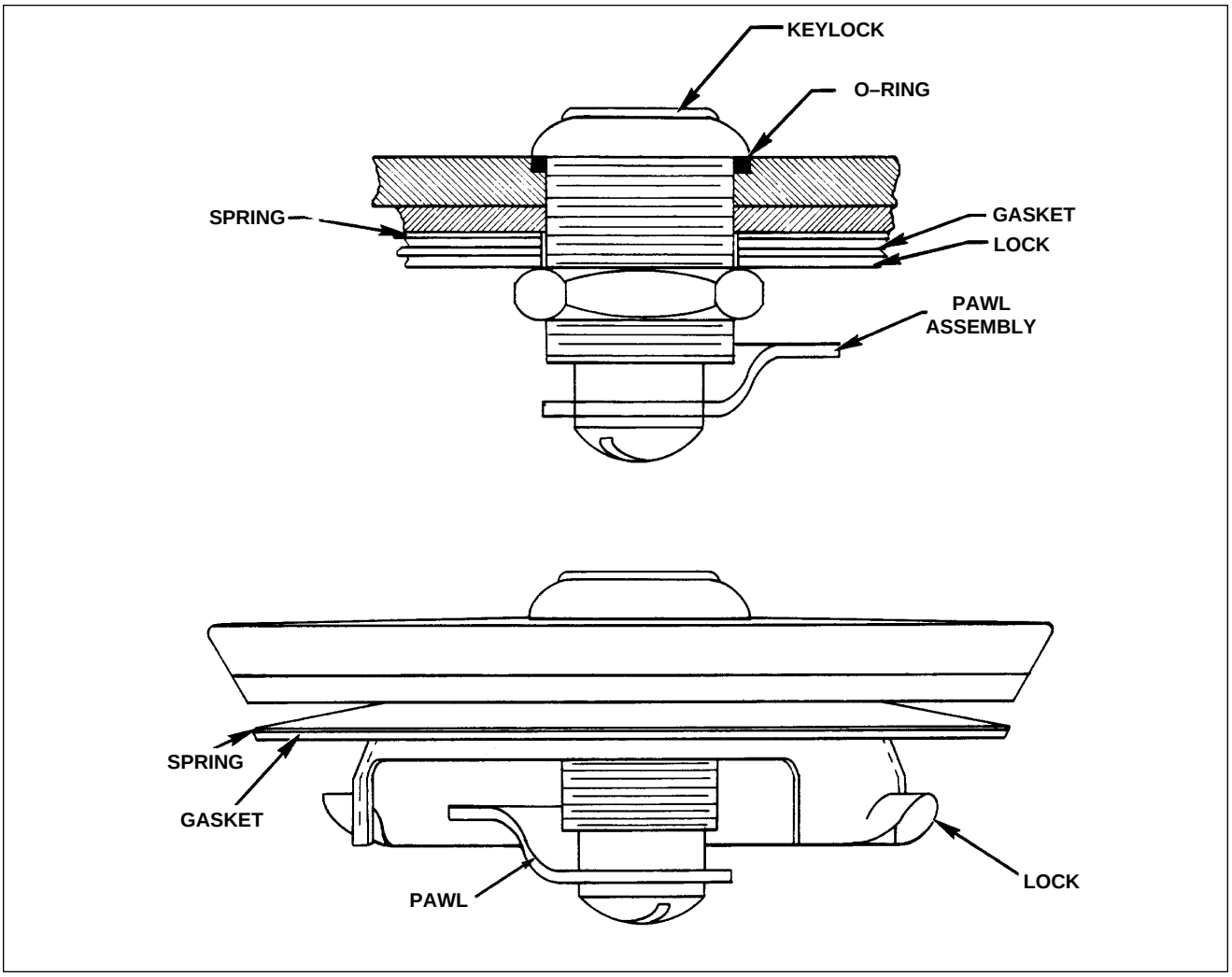


Figure 28-4. Archer III Locking Fuel Cap

THIS SPACE INTENTIONALLY LEFT BLANK

DISTRIBUTION

A. GENERAL

The components used in the fuel distribution system are essentially identical in the Archer II and the Archer III. Unless specified otherwise, the following procedures are used for both models of the Archer.

B. FUEL SELECTOR VALVE

1. Removal Of Fuel Selector Valve

a. Remove three screws holding selector cover and screw holding handle. Remove side panel to access selector valve.
b. Remove selector handle and cover.
c. Disconnect fuel lines from selector valve.
d. Remove fuel valve assembly attaching screws to remove fuel valve assembly.

2. Installation Of Fuel Selector Valve

a. Secure valve to bulkhead attachment location with attaching screws.

—CAUTION—

Seal all pipe threads with Titeseal No. 3.

b. Connect fuel lines to valve.
c. Install side panel.
d. Install selector cover with attaching screws.
e. Install valve control handle with attaching screws.

C. FUEL FILTER BOWL AND SCREEN (Refer to Figure 28-4.)

1. Removal Of Fuel Filter Bowl And Housing

—CAUTION—

Verify all electrical leads are disconnected before cowl removal.

a. Check fuel shutoff is in the off position.
b. Remove engine cowlings by releasing cowl fasteners and attaching screws.
c. Disconnect fuel lines from filter bowl housing.
d. Cut safety wire, loosen bail nut, move bail wire to the side, and remove bowl.
e. Spread the ends of the bail wire to remove filter bowl housing.

2. Cleaning And Inspection of Filter Bowl Screen

a. Follow preceding steps a., b., and d, for removal of filter bowl.
b. Remove gasket and screen from filter housing.
c. Clean screen and bowl with acetone or a suitable dry type solvent. If damaged, replace screen. (If replacing screen, also replace gasket.)
d. Position bowl and bail wire. Tighten bail nut.
e. Safety bail nut and bail wire assembly.

1. BODY
2. SCREEN
3. GASKET
4. STRAINER BOWL
5. BAIL WIRE
6. BAIL ASSEMBLY
7. SAFETY WIRE
8. DRAIN VALVE*

* S/N'S 2890146 AND UP HAVE NON-LOCKING DRAIN VALVES.

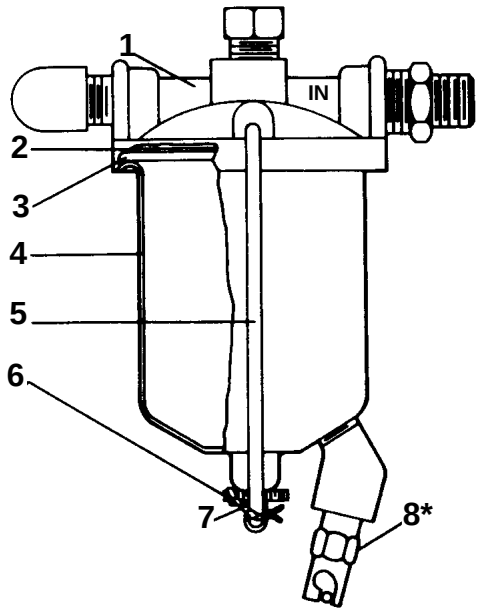


Figure 28-5. Fuel Filter Bowl and Screen

3. Installation Of Fuel Filter Bowl And Screen

a. Position the top of filter bowl to bracket, (check the word in on top of inlet port is aft toward firewall). Connect fuel lines.
b. Spread bail wire ends and insert through holes in the side of mounting bracket and filter bowl top.
c. Position bowl and bail wire. Tighten bail nut.
d. Safety bail nut and bail wire assembly.
e. Install engine cowling.

D. ELECTRIC FUEL PUMP

1. General

The Archer II is equipped with a 14 Vdc electric fuel pump, while the Archer III is equipped with a 28 Vdc electric fuel pump. These pumps are ***not*** interchangable. Reefer to parts catelog for repalcement part numbers. The pump is mounted on the left forward side of the firewall on both models. Other than voltage, both pumps are basically identical.

2. Removal Of Electric Fuel Pump

—CAUTION—

Check all electrical leads are disconnected before fuel pump removal.

Remove electric fuel pump as follows:

a. Remove the cowlings by releasing cowl fasteners and attaching screws.
b. Check fuel shutoff valve is in the off position.
c. Disconnect fuel pump electrical leads.

d. Disconnect fuel lines from inlet and outlet sides of pump.
   (1) Archer II: disconect the fuel inlet and outlet lines.
   (2) Archer III: Disconnect fuel inlet line from pump. Disconnect the main fuel and fuel primer outlet lines from tee fitting.
e. Remove nuts and bolts holding pump to its mounting bracket and remove fuel pump.

3. Disassembly Of ElectricFuel Pump (Refer to Figure 28-5.)

Pump repair is limited to fuel reservoir area only, since the electrical system is sealed. Disassemble fuel pump as follows:

—CAUTION—

Do not damage the screen when removing it from the pump housing.

a. Cut safety wire and remove bottom cover, gasket, magnet, and filter screen from pump.

—CAUTION—

Do not remove buffer spring and valve from plunger assembly.

—CAUTION—

Do not tamper with seal (center of mounting bracket) at the side of the pump. It retains the dry gas surrounding the elec - trical system in the upper portion of pump.

b. Use thin nose pliers to spread and remove retainer ends from plunger tube. Remove retainer spring from tube.
c. Remove washer, O-ring seal, cup valve, and plunger assembly from pump.

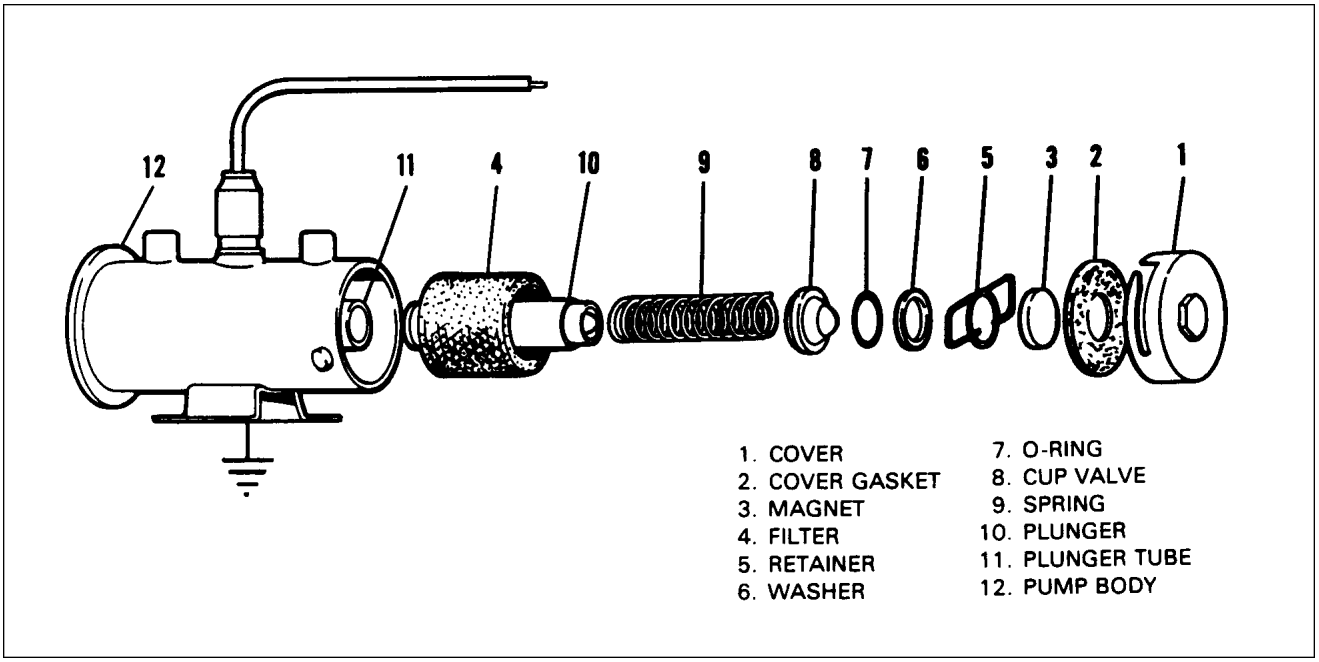


Figure 28-6. 14 Vdc and 28Vdc Electric Plunger Type Fuel Pump

4. Cleaning, Inspection, And Repair Of Electric Fuel Pump

a. Clean all parts with acetone or a suitable dry type solvent. If plunger assembly does not come clean or there are any rough spots, polish gently with crocus cloth.
b. Inspect pump for the following:
   (1) Check filter screen for damage or distortion.
   (2) Gently touch cup valve and check for freedom of movement. Do not disassemble.
   (3) Shake plunger assembly and listen for clicks to indicate valve action.
   (4) Check O-ring condition.
   (5) Check cover gasket and plunger spring cup gasket condition.
c. Pump repair is limited to replacement of defective parts during inspection.

5. Resistance Check (Plunger Type Pump)

To check the resistance of pump, connect an ohmmeter to pump lead wire and pump body. Reading must be 4.87 to 6.40 ohms for a 12-volt pump.

6. Assembly Of Electric Fuel Pump (Refer to Figure 28-5.)

a. Insert plunger assembly (10) in tube (buffer spring end first). Check fit by slowly raising and lowering plunger, (test for sticking). If a click cannot be heard, interrupter assembly is not functioning properly and pump must be replaced.
b. Install component parts in the following order: Cup valve, O-ring seal, and washer. Install the retainer spring securing components inside pump housing.
c. Place cover gasket and magnet in the bottom cover with filter screw.
d. Carefully guide screen around plunger spring cup. Screen must fit snug at both ends. Do not pinch or distort screw. Draw bottom cover tight with a wrench, and safety.

7. Adjustment Of Electric Fuel Pump (Bench Test)

a. Check pump is sufficiently lubricated to prevent damage if run dry for more than five minutes.
b. Connect electrical lead of one pump to 14-volt dc power source (Archer II), or 28-volt dc power source (Archer III).
c. Using a suitable container with the proper octane fuel, connect a fuel line from a container to inlet side of pump.
d. Connect another line from outlet side of pump to a pressure gauge and bypass valve, and back to the container.
e. Run pump with bypass valve open until there is a steady fuel flow. Close bypass valve and check pressure gauge for 4.00 to 4.75 psi maximum, no flow.
f. Repeat steps b. through e. for second fuel pump.
g. Replace plunger spring or the complete pump assembly, if necessary, if the proper pressure is not obtained.

8. Adjustment Of Electric Fuel Pump (In Airplane)

a. With cowling removed and fuel selector in the OFF position, remove fuel line from outlet end of pump.
b. Connect a test line with a bypass valve and pressure gauge to pump outlet end.
c. Place a container below pump to catch any fuel from test line during pump adjustment.
d. Turn fuel selector on, open bypass valve on test line, and start pump.
e. When there is a steady fuel flow close bypass valve and check pressure gauge reading. Reading must be 4.00 to 4.75 psi maximum, no flow. (Do not keep bypass valve closed for more than one minute during pump operation and adjustment.)
f. Replace plunger spring or pump assembly, if necessary, if the proper pressure is not obtained.
g. Connect the original fuel line to pump. Open fuel selector and run pump. Check for fuel leaks.
h. Shut off pump, close fuel selector, and replace and secure access panel.

8. Installation Of Electric Fuel Pump

a. Position fuel pump to engine mount frame and secure with bolts, washers, and nuts.
b. Connect fuel lines to pump.
   (1) Archer II: connect the fuel inlet and outlet lines.
   (2) Archer III: connect fuel inlet line pump. Connect the main fuel and fuel primer outlet lines to tee fitting.
c. Connect electrical leads to pump.
d. Turn fuel shutoff on and operate fuel pump. Check all fuel line fittings for leakage.
e. Install cowling.

D. LINES AND FITTINGS

1. Inspection And Tightening Of Fuel Line Union Fittings

a. Remove aft inboard inspection panel from the lower surface of right and left wing.
b. Remove pilot's seat and left cabin side panel. Fold back carpeting and remove the cover from fuel line(s).
c. Inspect all union fittings in fuel system for signs of leakage. (Note any leaking fittings for repair or replacement.)

—CAUTION—

A crow's foot adapter other than a tubing type will deform or damage union nut and will cause a leak requiring union and tubing replacement.

—CAUTION—

If during torque check a galled nut and union are suspected, back off the nut and inspect threads. If the union is service - able, lubericate threads with MIL-L-5606 hydraulic fluid. Torque the nut to values per step d. If union is unserviceable replace per replacement of fittings

d. Use a torque wrench and tubing crow's foot, to carefully tighten each union fitting to the following torques:

Tube Size	Applied Torque	
1/4 in. od	75- 95 inch-pounds	using a tubing
3/8 in. od	175-195 inch-pounds	crow's foot.

Apply thread lubricant to male connector threads only. Do not let lubricant enter the connector seat throat or contact ferrule seat face.

e. After torquing each fitting measure distance between face of union nut and face of tubing nut. (Refer to figure 28-6 for tolerance.)
f. Replace any out of tolerance fitting per replacement of fittings.
g. Check all unions for proper tightness. Check all repairs are made. Verify airplane is full of fuel and run engine three to five minutes on each tank. (Perform engine operation in a safe manner and location.)
h. Shut down engine and wiggle all unions. If any fittings are leaking, repair per replacement of fittings.
i. When system is leak free, replace side panel, carpet, access plates, and seat.
j. Make an appropriate logbook entry.

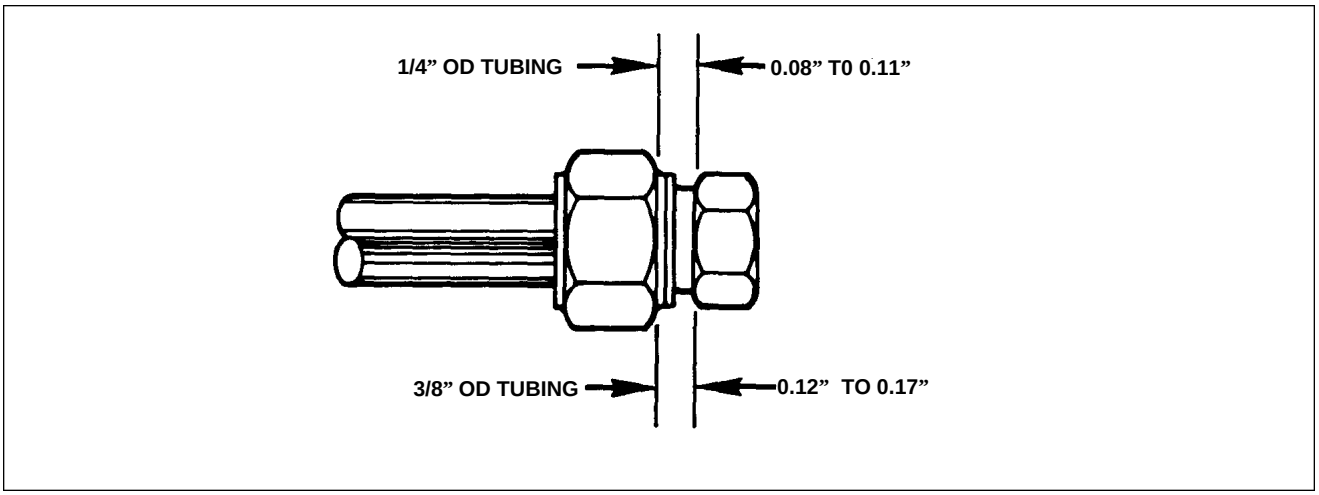


Figure 28-7. Tolerances, Union Nut, and Tubing Nut

2. Replacement Of Fittings

—NOTE—

Airplane defueling may be required for union or tubing replacement.

a. Repair fittings that show evidence of galling, do not meet figure 28-5 dimensional requirements, or leak after tightening.
b. The recommended repair is to remove leaking union and replace with standard AN fitting as per AC43.13-1A paragraph 392. This will require cutting off swaged ferrule and adding a short length of tubing.

c. A replacement tube and union purchased from Piper will have the ferrule pre-swaged onto tube. Install tube as follows:
   (1) Lubericate male threads of union with MIL-L-5606 hydraulic fluid.
   (2) Carefully align tube into union and snug up the nut with a wrench.
   (3) Using the wrench, tighten nut one to two flats (1/6 to 1/3 turn).

d. Repairs made using Parker Hannifin unions and tubes without pre-swaged ferrules must be installed as follows:
   (1) Cut off tubing back from the fitting.
   (2) De-burr tube end and prepare a short length of tube, to splice into line.
   (3) llubricate the ferrule and threads on the body and nut with MIL-L-5606 hydraulic fluid.
   (4) Screw nut and ferrule onto union until solidly finger tight.
   (5) Insert tubes into unions and check proper straight alignment of tubing and union.
   (6) Tighten nut one and one-quarter turns using a tubing wrench.

e. Perform leak test per steps 1, g and h.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

INDICATING

A.. FUEL QUANTITY TRANSMITTER UNIT

1. Removal Of Archer II and Archer III Fuel Quantity Transmitter Unit

a. Remove fuel tank. (Refer to removal of fuel tank, section 28-10-00.)
b. Disconnect transmitter wire from the connection post.
c. Cut safety wire securing the five attaching screws.
d. Remove five screws and remove unit.

2. Installation Of Archer II and Archer III Fuel Quantity Transmitter Unit

a. Position transmitter and gasket to fuel tank and secure with bolt, lock washer, and flat washers. (Tighten to torque of 25 inch-pounds.)
b. Install fuel tank. (Refer to installation of fuel tank.)

B. FUEL QUANTITY TRANSMITTER/GAUGE CHECK (INSTALLED)

1. Archer II with A. C. Sparkplug Gauges

a. Check fuel quantity transmitter unit and gauge as follows:
(1) Level airplane, ± 1°, longitudinally and laterally.
(2) Turn fuel selector valve off.
(3) Completely drain fuel tank that relates to the gauge to be checked. (Refer to draining fuel system, chapter 12.)
(4) Place battery-alternator switch in OFF position.

—CAUTION—

Power supply should be capable of supplying 14 Vdc to the gauge.

(5) Connect external power supply unit. Connect the red (positive) lead to the starter solenoid heavy terminal which is ***not*** connected to the starter.

— NOTE —

External power supply used in order to supply consistent voltage to sender and gauge.

(6) Adjust power supply unit to provide 13.5 to 14.5 Vdc. Allow gauges to warm-up for a minimum of three minutes.

— NOTE —

Connect a wire to the sender side of each gauge. To read gauge ground wire momentarily to airframe through a 200 Ω resis - tor at the 0 and 5 gallon positions; through a 35 Ω resistor at the 10 through 20 gallon positions; no resistor at the full (25 gallon) position.

(7) Place one U. S. gallon of fuel in each tank. Momentarily ground wire through a 200 Ω resistor to airframe.

(8) After needle on each gauge descends to a stable reading (:15 seconds minimum), observe fuel quantity gauge. It should read empty. (Refer to chart 2802 for tolerances permitted between fuel gauge reading and actual fuel in tank.)

(10) Add fuel to tank in five U.S. gallon increments until tank is full. Ground wire through appropriate resistor to airframe. Check gauge readings.

—NOTE—

It is permissible to adjust float assembly to obtain specified tol - erances

CHART 2802. TRANSMITTER/FUEL GAUGE TOLERANCES

MAIN TANK	
ACTUAL FUEL IN TANK (U.S. Gal.)	GAUGE READING (U.S. Gal.)
Full	22 to Full*
20	17 to 24
15	12 to 17
10	7 to 12
5	2 to 6
0	0 to -2
*Plus one needle width	

2. Archer II with Stewart Warner or Rochester Gauges

— CAUTION —

Rochester sending units are NOT compatible with A. C. Sparkplug or Stewart Warner gauges. Rochester gauges MUST be used with Rochester sending units

a. Pre-installation check:

(1) Apply 14 Vdc to the terminals at the rear of the gauge through a resistor network comprised of the resistive values specified in the Chart 2802. Verify that, for each resistive value, the gauge indication is as specified in Chart 2802.

CHART 2803 FUEL QUANTITY GAUGE RESISTANCE/TOLERANCE VALUES

RESISTANCE IN OHMS (Ω)	GAUGE INDICATION	TOLERANCE (NEEDLEWIDTHS)
0	DOT	±1/2
3	0	-1/2, +0
14	5	±1/2
23	10	±1
33	15	±1
45	F	±1

b. Post installation check.
(1) Level airplane, ± 1°, longitudinally and laterally.
(2) Place battery-alternator switch in OFF position.(3) Completely drain fuel tank that relates to the gauge to be checked. (Refer to draining fuel system, chapter 12.)
(4) Connect external power supply unit. Connect the red (positive) lead to the starter solenoid heavy terminal which is ***not*** connected to the starter.
(5) Adjust power supply unit to provide 13.5 to 14.5 Vdc. Allow gauges to warm-up for a minimum of three minutes.
(6) Place 1 U. S. gallon of fuel in each tank. After recording reading, add fuel in increments specified in table 2804. Check gauge readings.

— NOTE

After measured amount of fuel has been added, vibrate the tank by bumping its lower surface. Vibrate the gauge(s) by tapping gently on the gauge glass with fingers.

CHART 2804. 14 VDC FUEL QUANTITY GAUGE TOLERANCE VALUES

FUEL ADDED	ACTUAL FUEL IN TANK - U. S. GALLONS	ACCEPTABLE READINGS (IN NEEDLE WIDTHS)		
		GAUGE INDICATION	MINIMUM	MAXIMUM
1	1	0	-1 1/2	+0
5	6	5	-1	+1
5	11	10	-1	+1 1/2
5	16	15	1	+1 1/2
9	25	F	1	+1 1/2

3. Archer III 28 Vdc Fuel Gauges

The Archer III fuel gauges consist of individual indicators for the left and right fuel tanks contained in a common instrument.

a. Bench check:

The bench check requires the use of a resistance decade box containing a six position switch. (Refer to Figure 28-7)

(1) Connect a 5Ω resistor between the ground terminal (GND) and left or right sender terminal, appropriate to side ***not*** being tested. (Refer to Figure 28-7)
(2) Connect resistance decade to the left or right sender terminal, appropriate to side ***being*** tested. (Refer to Figure 28-7)
(3) Apply 28 Vdc, through the resistance decade, to the ground (GND) and positive (+) terminals. (Refer to Figure 28-7)
(4) Low end adjustment: (Refer to Figure 28-7
(a) Select position ***F*** on resistor decade switch.
(b) Verify the appropriate instrument needle points to zero (0).
(c) If needle does ***not*** point to 0, adjust ***NULL*** potentiometer, located on bottom of instrumentbelow side being tested, to center needle on 0.

(5) High end adjustment: (Refer to Figure 28-7
  (a) Select position ***A*** on resistor decade switch.
  (b) Verify the appropriate instrument needle points to F.
  (c) If needle does ***not*** point to F, adjust ***GAIN*** potentiometer, located on bottom of instrument below side being tested, to center needle on F.

(6) Full range check
  (a) After low and high end adjustments have been completed check that, for each resistive value, the gauge indication ia as specified in Chart 2805.

CHART 2805. 28 VDC FUEL QUANTITY GAUGE RESISTANCE/TOLERANCE VALUE

[1] SWITCH POSITION	RESISTANCE IN OHMS	GAUGE INDICATION	[2] TOLERANCE (NEEDLEWIDTHS)
F	3	0	+0, -1/2
E	14	5	± 1/2
D	23	10	± 1/2
C	33	15	± 1/2
A	45	F	± 1/2

[1] See Figure 1
[2] See Figure 2

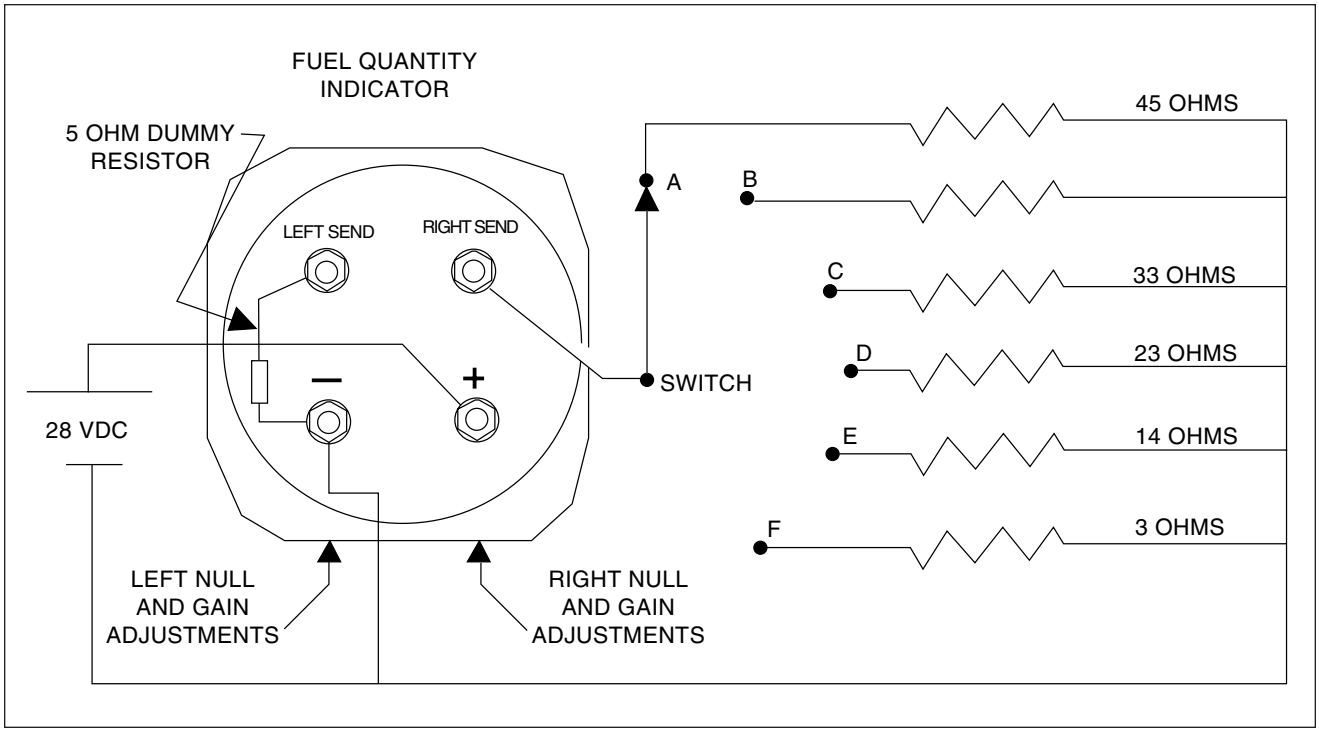


Figure 28-8. Resistance Decade Test Box Set Up

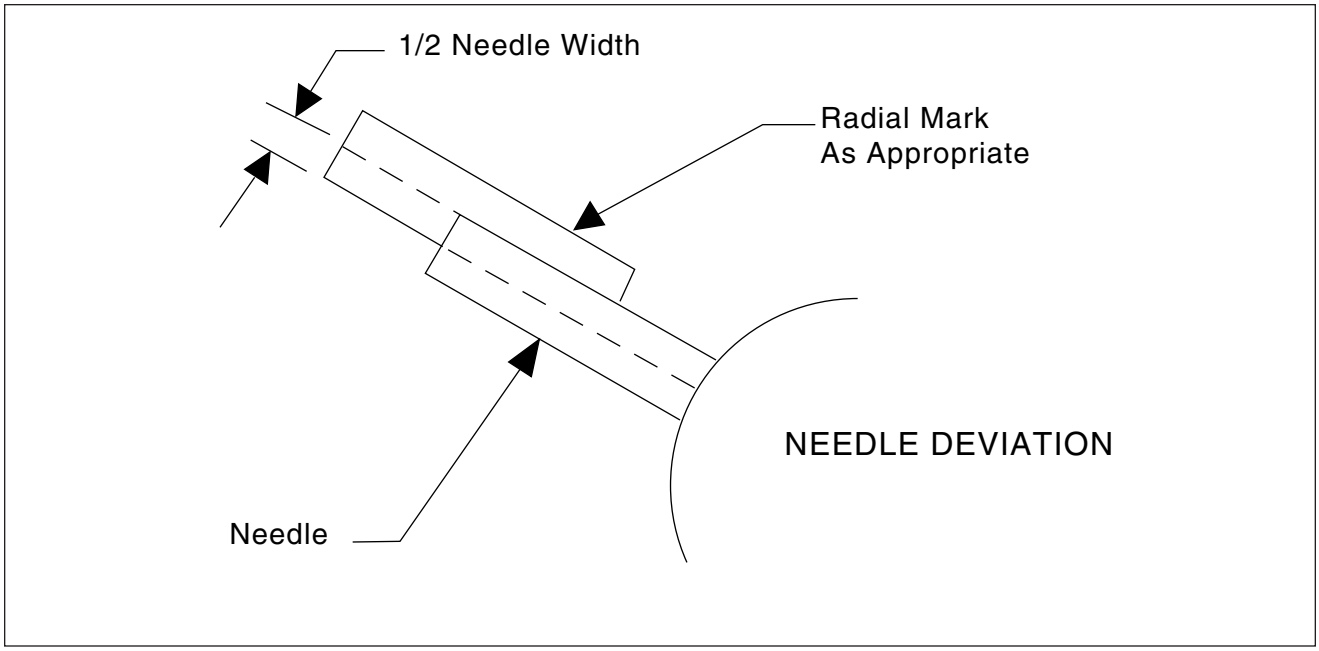


Figure 28-9. Archer III Fuel Quantity Needle Deviation

b. Post installation functional check:
   (1) Level airplane, ± 1°, longitudinally and laterally.
   (2) Place battery-alternator switch in OFF position.
   (3) Completely drain fuel tank that relates to the gauge to be checked. (Refer to draining fuel system, chapter 12.)
   (4) Connect external power supply to airplane's electrical system using APU connector.
   (5) Adjust power supply unit to provide 24 to 28 Vdc. Allow gauges to warm-up for a minimum of three minutes.
   (6) Place 1 U. S. gallon of fuel in each tank. After recording reading, add fuel in increments specified in table 2806. Verify gauge readings.

CHART 2806. 28 VDC FUEL QUANTITY GAUGE TOLERANCE VALUES

FUEL ADDED (U. S. GALLONS)	ACTUAL FUEL IN TANK (U. S. GALLONS)	GAUGE INDICATION	TOLERANCE (NEEDLEWIDTH)	RESISTANCE REFERENCE (OHMS BOTH SENDERS)
1	1	0	+0, -1	3
5	6	5	±3/4	14
5	11	10	±1	23
5	16	15	±1 1/2	33
9	25	F	±1 1/2	45

C. CHECK AND ADJUSTMENT OF FUEL QUANTITY TRANSMITTER UNIT

1. Archer II 14 Vdc Fuel Quantity Transmitter Check. (Piper P/N 486 520) (Refer to Figure 28-9.)

(a) Remove transmitter unit to be checked from the fuel tank.
(b) Check and adjust transmitter unit float position as follows:
  (1) Fasten unit to a fabricated checking jig with washer and nuts. (Fabricate jig per Figure 28-10 dimensions.)
  (2) Check with the float arm down against mechanical stop on transmitter, the float is just touching base of jig. (Float may be to 0.18 inch above base.) If float does not touch the base or float arm is not against bottom stop, adjust float assembly arm stop by bending it per Figure 28-9. The entire surface of float must be horizontal with the jig base.
(c) Check transmitter unit for correct resistance and dead spots as follows:
  (1) Connect an ohmmeter to transmitter unit and move float arm to its bottom mechanical stop. Ohmmeter must read ohms resistance as per chart 2807.
  (2) Move float arm to its upper mechanical stop and check ohms resistance.
  (3) Check for dead spots by slowly moving float arm from bottom stop, to upper stop, and back. Ohmmeter indicator must move steadily up and down scale without fluctuation as float arm is moved.
  (4) If there is incorrect resistance or dead spots, replace sending unit.

CHART 2807. FUEL QUANTITY TRANSMITTER
CALIBRATION TOLERANCES

UNIT	POSITION	RESISTANCE
P/N 486 520 (Rubber Float)	Empty Full	240 +20, -0 ohms 33.5 +0, -4.5 ohms

2.Archer III 28 Vdc Fuel Quantity Transmitter Check. (Piper P/N 548 671)

(a) Remove transmitter unit to be checked from the fuel tank.
(b) Check and adjust transmitter unit float position as follows:
  (1) Fasten unit to a fabricated checking jig with washer and nuts as shown in Figure 28-9. (Fabricate jig per Figure 28-10 dimensions.)
  (2) Check with the float just touching the top of a 0.27 inch spacer back, the resistance of the sending unit is 3 ohms, ± 0.5 ohm. If the resistance of the sending unit is not in this range, adjust arm of the float assembly by ***gently*** bending it as shown in Figure 28-9. The entire float ***must*** be ***kept horizontal*** to the ***base*** of the fixture.
(c) Check transmitter unit for correct resistance and dead spots as follows:
  (1) Remove sending unit from the checking fixture and connect it to an ohmmeter. Allow float arm to rest on the bottom mechanical stop. Ohmmeter must read 0, ± 0.5 ohms resistance .
  (2) Move float arm to its upper mechanical stop. A resistance of 45, ± 2 ohms must be indicated.
  (3) Check for dead spots by slowly moving float arm from bottom stop, to upper stop, and back. Ohmmeter indicator must move steadily up and down scale without fluctuation as float arm is moved.
  (4) If there is incorrect resistance or dead spots, replace sending unit.

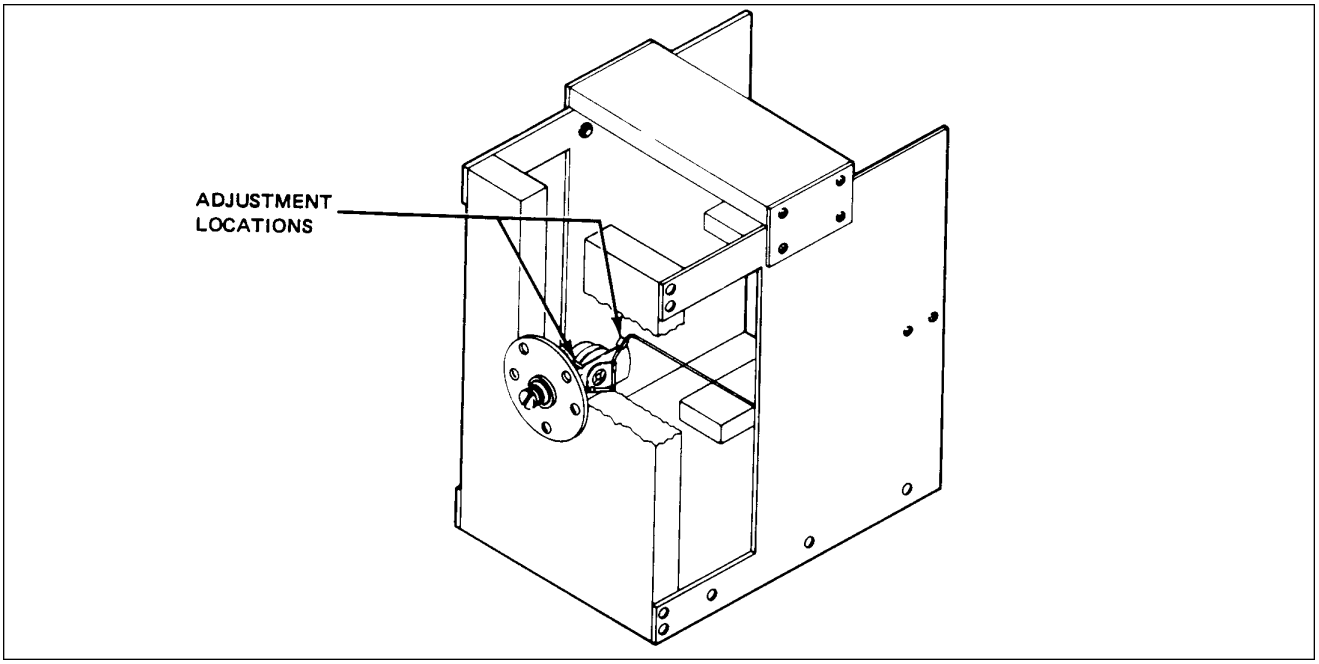
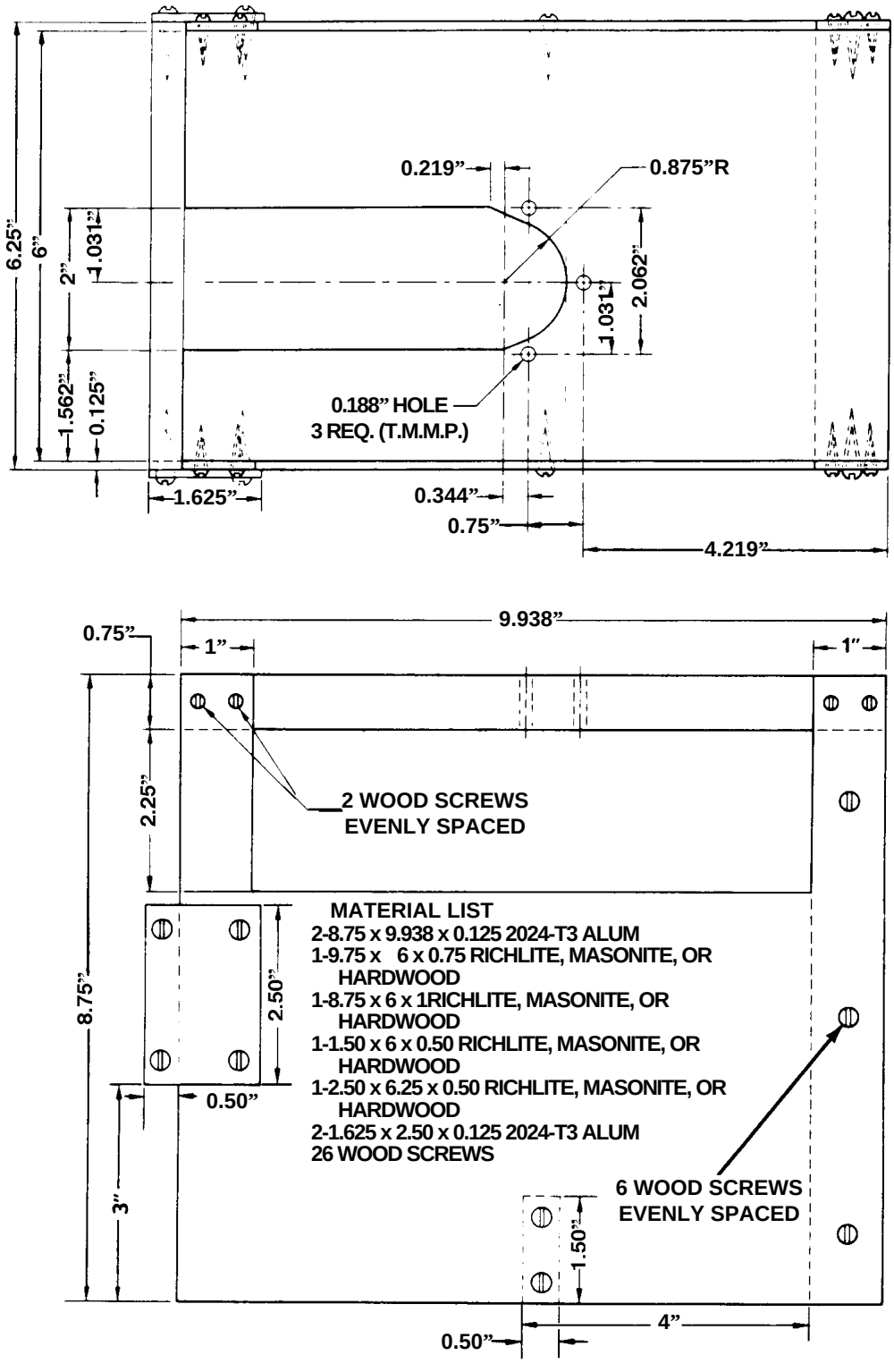


Figure 28-10. Fuel Quantity Transmitter Checking Jig

THIS SPACE INTENTIONALLY LEFT BLANK



Fiure 28-11. Fabricated Fuel Quantity Transmitter Checking Jig.

D. FUEL QUANTITY INDICATOR

Two fuel quantity gauges are mounted in cluster on the instrument panel. The Archer II instruments are calibrated in fractional divisions of one-fourth, one-half, three-fourth, and full. The Archer III (s/n' 2890206 and up) instruments are calibrated in fractional divisions of 0, 5, 10, 15, 20 (gallons), and F (FULL). A transmitter unit is installed in each fuel tank. The unit contains a resistance strip and a movable control arm. The arm position is controlled by a float in the fuel tank. The float position is transmitted electrically to the indicator gauge, which reads the amount of fuel in each tank.

CHART 2808 TROUBLESHOOTING FUEL QUANTITY INDICATORS

TROUBLE	CAUSE	REMEDY
Fuel gauge fails to indicate.	Broken wiring.	Check and repair.
	Defective gauge .	Replace gauge.
	Blown fuse. (Archer II.)	Replace fuse.
	Tripped circuit breaker. (Archer III.)	Reset circuit breaker. If breaker does not remain set, check wiring and components for short.
Fuel gauge reads empty when tanks are full.	Incomplete ground.	Check ground connections at fuel transmitter in wings.
	Float completely filled or saturated.	Replace fuel transmitter.
	Gauge not properly adjusted. (Archer III)	Check gauge settings per paragraph C.
	Defective gauge.	Replace gauge.
Fuel gauge reads full with tanks empty.	Incomplete ground.	Check ground at instrument.
	Float arm stuck.	Replace fuel transmitter.
	Gauge not properly adjusted. (Archer III)	Check gauge settings per paragraph C.
	Defective gauge.	Replace gauge.
Fuel gauge reads incorrectly.	Intermittent ground.	Check ground at transmitter and instrument.
	Float arm sticky.	Replace transmiter.
	Faulty transmitter	Replace transmitter.
	Gauge not properly adjusted. (Archer III)	Check gauge settings per paragraph C.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

32

LANDING GEAR

2E16

CHAPTER 32 - LANDING GEAR

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
32-00-00	GENERAL	2E20	
32-00-00	Description	2E20	
32-00-00	Troubleshooting	2E20	
32-10-00	MAIN GEAR	2E24	
32-10-00	Disassembly of Main Gear Oleo	2E24	
32-10-02	Cleaning, Inspection, and Repair of Main Gear Oleo	2E24	
32-10-03	Assembly of Main Gear Oleo	2F3	
32-10-00	Removal of Main Landing Gear	2F3	
32-10-00	Cleaning, Inspection, and Repair of Main Landing Gear	2F5	
32-10-00	Installation of Main Landing Gear	2F5	
32-20-00	NOSE GEAR	2F7	
32-20-00	Disassembly of Nose Gear Oleo	2F7	
32-20-00	Cleaning, Inspection, and Repair of Nose Gear Oleo	2F9	
32-20-00	Nose Gear Oil Orifice Retainer Ring Installation	2F9	
32-20-00	Assembly of Nose Gear Oleo	2F9	
32-20-00	Removal of Nose Landing Gear	2F12	
32-20-00	Cleaning, Inspection, and Repair of Nose Landing Gear	2F12	
32-20-00	Installation of Nose Landing Gear	2F12	
32-20-00	Alignment of Nose Gear	2F13	
32-40-00	WHEELS AND BRAKES	2F16	
32-40-00	Removal and Disassembly of Main Wheel	2F16	
32-40-00	Inspection of Main Wheel Assembly	2F17	
32-40-00	Assembly and Installation of Main Wheel	2F17	
32-40-00	Removal and Disassembly of Nose Wheel	2F17	
32-40-00	Inspection of Nose Wheel Assembly	2F18	
32-40-00	Assembly and Installation of Nose Wheel	2F18	
32-40-00	Brake Adjustment and Lining Tolerance	2F19	
32-40-00	Removal and Disassembly of Brake Assembly	2F19	
32-40-00	Cleaning, Inspection, and Repair of Brake Assembly	2F21	
32-40-00	Assembly and Installation of Brake Assembly	2F21	

CHAPTER 32 - LANDING GEAR

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
32-40-00	WHEELS AND BRAKES (cont)	—	
32-40-00	Removal of Brake Master Cylinder (Hand Brake)	2F21	
32-40-00	Disassembly of Brake Master Cylinder	2F21	
32-40-00	Cleaning, Inspection, and Repair of Brake Master Cylinder	2F23	
32-40-00	Assembly of Brake Master Cylinder	2F23	
32-4 0-00	Installation of Brake Master Cylinder (Hand Brake)	2F24	
32-40-00	Removal of Brake Cylinder (Toe Brake)	2F24	
32-40-00	Disassembly of Brake Cylinder	2F24	
32-40-00	Cleaning, Inspection, and Repair of Brake Cylinder	2F24	
32-40-00	Assembly of Brake Cylinder	2G3	
32-40-00	Installation of Brake Cylinder	2G3	
32-40-00	Brake Bleeding Procedure (Gravity)	2G3	
32-40-00	Brake Bleeding Procedure (Pressure)	2G4	
32-40-00	Brake System Leak Check	2G4	
32-40-00	Bleeding of the Brakes After a Unit Has Been Changed	2G5	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publications when servicing or inspecting vendor equipment installed in Piper aircraft.

In this chapter are instructions for the removal, disassembly, inspection, overhaul, and installation of the landing gear, nose gear alignment, and the repair and service of the brake system and its components.

A. DESCRIPTION

The landing gear is a fixed tricycle type, fitted with three 6.00 x 6 wheels. The landing gear struts are the air-oil type. The nose gear, steerable through a wide arc, allows a short turning radius in each direction. A spring device is attached to the rudder pedal torque tube assembly to provide rudder trim and to aid in nose wheel and rudder centering. Bungee springs on the push rods make lighter and smoother ground steering possible. A shimmy damper is incorporated in the nose wheel steering mechanism.

The two main wheels are equipped with a single disc hydraulic brake assembly connected to a cylinder actuated by a hand lever, or by individual cylinders attached to each rudder pedal. A brake fluid reservoir is installed on the left forward face of the engine firewall.

Wheel pants are offered as optional equipment on the Archer II. The wheel pants are standard equipment on the Archer III.

B. TROUBLESHOOTING

It may be necessary to place the airplane on jacks when troubleshooting the landing gear system (see chapter 7).

CHART 3201. TROUBLESHOOTING LANDING GEAR (SHEET 1 OF 3)

TROUBLE	CAUSE	REMEDY
Nose landing gear shimmies during fast taxi, takeoff, or landing.	Internal wear in shimmy dampener.	Replace shimmy dampener.
	Worn steering horn bolt holes.	Replace horn assembly.
	Excessive free play in steering bungees.	Rework or replace.
	Shimmy dampener or bracket loose at mounting.	Replace necessary parts and bolts.
	Tire out of balance.	Check balance and replace tire if necessary.
	Worn or loose wheel bearings.-	Replace or adjust wheel bearings.

CHART 3201. TROUBLESHOOTING LANDING GEAR (SHEET 2 OF 3)

TROUBLE	CAUSE	REMEDY
Nose landing gear shimmies during fast taxi, takeoff, or landing. (contd.)	Worn torque link bolts or bushings.	Replace bolts or bushings
	Improper nose wheel fairing.	Replace with proper fairing.
Excessive or uneven wear on nose tire.	Incorrect operating pressure.	Inflate tire to correct pressure.
	Wear resulting from shimmy.	Refer to preceding Trouble column for correction.
Nose gear does not steer properly.	Oleo cylinder binding in strut housing.	Lubricate strut housing. (Refer to Lubrication Chart.)
		Cylinder or strut housing bushings damaged.
	One brake dragging.	Determine cause and correct.
	Steering bellcrank loose on attachment plate.	Adjust and tighten.
	Steering bellcrank bearing or bolt worn.	Replace bearing or bolt.
	Shimmy dampener galling or binding.	Replace.
	Steering bungee broken internal spring.	Replace.
	Binding in either rudder trim or steering bungee.	Grease.
Nose or main landing gear shimmies during fast taxi, takeoff, or landing.	Tire out of balance.	Check balance and replace tire if necessary.
	Loose torque links.	Adjust side play.
	Worn or loose wheel bearings. .	Replace or adjust wheel bearings.
	Worn torque link bolts or bushings.	Replace bolts or bushings.

CHART 3201. TROUBLESHOOTING LANDING GEAR (SHEET 3 OF 3)

Excessive or uneven wear on main tires.	Incorrect operating pressure.	Inflate tire to correct pressure.
	Wheel out of alignment (toe in or out).	Check wheel alignment.
Strut bottoms on normal landing or taxing on rough ground.	Insufficient air or fluid in strut.	Service strut with air or fluid.
	Defective internal parts in Strut.	Replace defective parts.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

MAIN GEAR

A. DISASSEMBLY OF MAIN GEAR OLEO (Refer to Figure 32-1.)

—NOTE—

Main gear axle and piston tube assembly are removed from cylinder housing with the gear either removed from or installed on the airplane. The gear must be removed from the airplane in order to remove metering component in the top of housing. (Refer to removal of gear.)

1. Place airplane on jacks. (Refer to chapter 7.)
2. Place drip pan under main gear to catch spillage.
3. Remove the gear axle and piston tube assembly as follows:
   a. Remove air from oleo chamber by depressing air valve core pin in the inspection hole on top of wing. After pressure in oleo chamber has diminished, remove valve core pin and attach a small hose to air valve. Drain fluid by slowly compressing piston tube.
      To extract more fluid, remove filler plug, insert a siphon hose, and drain fluid from upper area of housing.
   b. Disconnect flexible brake line at elbow on brake assembly.
   c. Disconnect torque link assembly by removing any one of three cotter pins, nuts, washers, and bolts. (Note arrangement of components for installation.) Carefully slide piston tube from the cylinder housing.
   d. Remove scraper ring, located inside lower end of cylinder housing, by first removing retainer ring, spacer ring, and scraper ring.
   e. Remove O-ring seal, located just before scraper ring, by using a curved wire or spoon shaped tool and inserting it under ring.
4. Remove cylinder head and orifice assembly as follows:
   a. Cut safety wire and remove bolts that hold cylinder head in the top of housing. Remove assembly from housing.
   b. If O-ring was used with cylinder head, remove and discard O-ring. If O-ring was not used with cylinder head, remove all traces of sealant from around cylinder head and top of housing.

—CAUTION—

Do not remove orifice unless it necessitates replacement.

   c. Remove orifice assembly from within housing by rotating it counterclockwise out of housing with a 0.50 x 0.125 stud type spanner wrench. (Refer to Figure 32-2.)

B. CLEANING, INSPECTION AND REPAIR OF MAIN GEAR OLEO

—NOTE—

Oleo repair is limited to smoothing out minor scratches, nicks and dents, and replacement of parts.

1. Clean all parts with a suitable dry type cleaning solvent.
2. Inspect landing gear oleo components for the following:
   a. Bearing surfaces of housing for excess wear, corrosion, scratches, and overall damage.

b. Retaining ring for cracks, burrs, etc.
c. Cylinder tube for corrosion, scratches, nicks, excessive wear, and misalignment.
d. Air valve for operation and general condition.
e. Orifice plate for hole restriction.

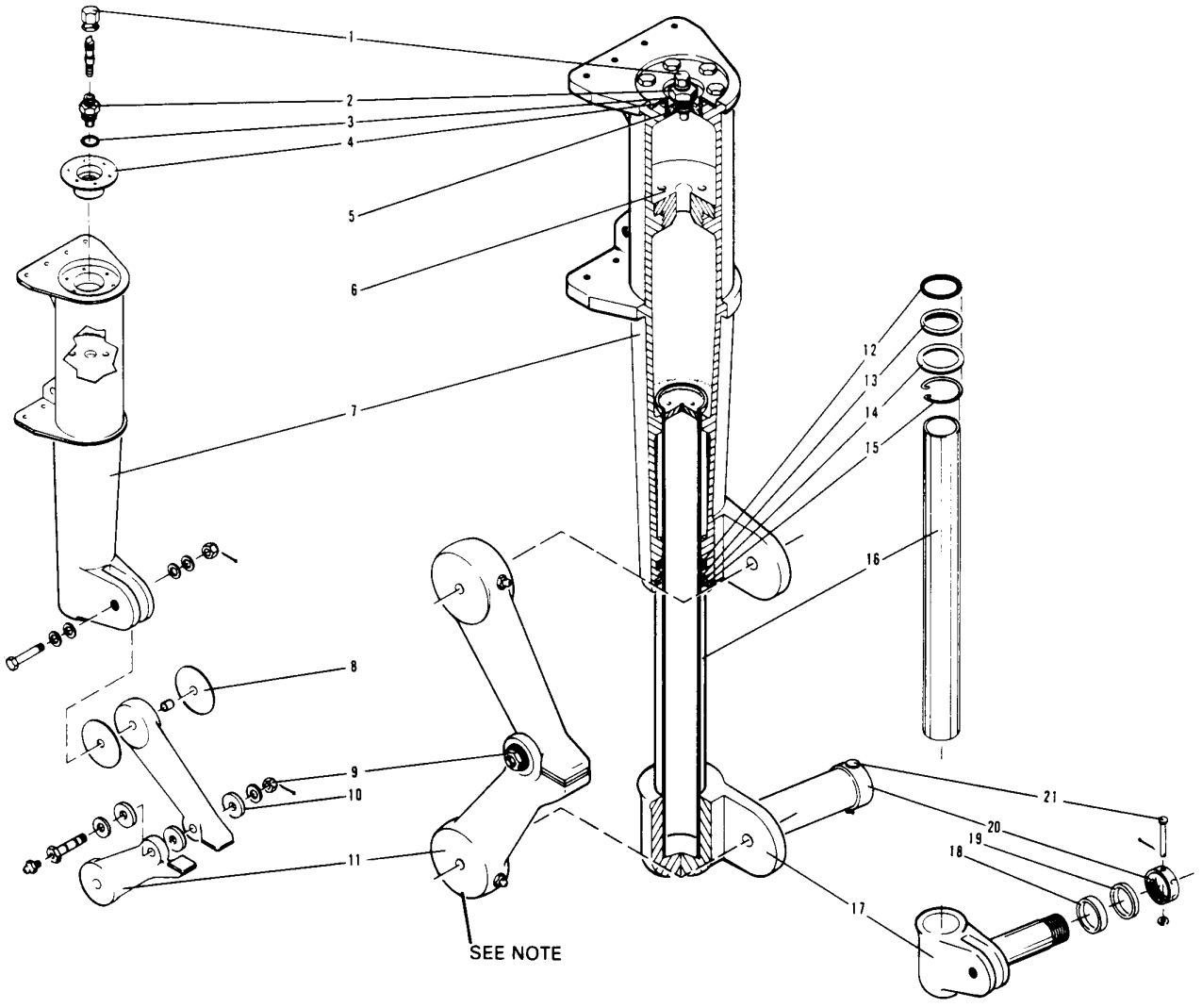


Figure 32-1. Main Gear Oleo Strut Assembly

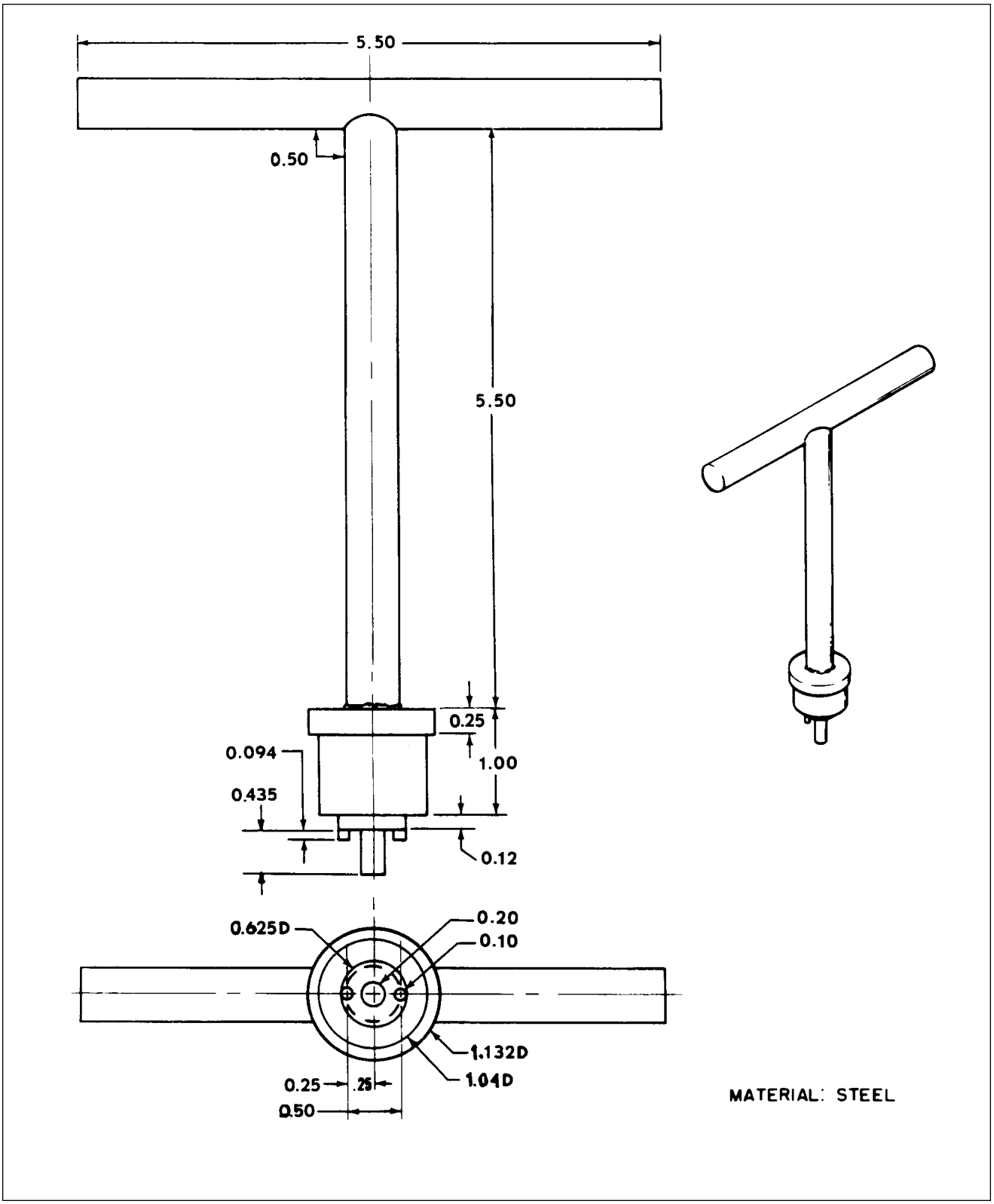


Figure 32-2. Orifice Replacement Tool

C. ASSEMBLY OF MAIN GEAR OLEO (Refer to Figure 32-1.)

1. Install orifice assembly as follows:
   a. Insert orifice through opening in top of gear housing and turn it into the threaded hole web. Tighten orifice with a stud type spanner wrench.
   b. Lubricate and install O-ring or apply a thin layer of Permatex Forma-Gasket no. 6 Sealant, directly under flange of cylinder head.
   c. Secure cylinder head with bolts, and safety with MS20995-C32 wire.
2. Assemble piston tube components on the tube by placing, in order, retainer ring, spacer ring, and scraper ring. Insert O-ring into annular slot in bottom of housing.

—CAUTION—

Do not damage or dislocate O-ring in housing when inserting piston into housing.

3. Lubricate piston wall and carefully insert piston into housing.

—CAUTION—

Links must be loose enough to allow free action of the gear, but also resist side play. Overtightening will cause binding or damage to links.

4. Verify bushings are installed in upper and lower torque links. Install links. At cable end of each link, install (with brake line hose bracket) bearing washers, bolt, washer, nut, and cotter pin. At connection point of upper and lower links, attach (with brake line hose brackets) spacer washers, grease bolt, washers, nut, and cotter pins. Install washers (AN960-816L) under head of bolt for firm sliding fit between the two links.
5. To eliminate side play of torque links, use 0.005 shim washers (Piper P/N 63311-03) as required. Maximum side play is 0.005/0.007. (Refer to Figure 32-2.)
6. Slide scraper and spacer rings into place. Secure with retainer ring in the annular slot in bottom of housing.
7. Install hydraulic brake line.
8. If removed, install landing gear. (Refer to installation of main landing gear.)
9. Service oleo strut as per Oleo Struts, Chapter 12.
10. Remove drip pan and slowly lower airplane from jacks.
11. Bleed brakes if necessary. (Refer to bleeding brakes.)

D. REMOVAL OF MAIN LANDLNG GEAR. (Refer to Figure 32-3.)

1. Place airplane on jacks. (Refer to Chapter 7.)
2. Place drip pan under main gear to catch spillage.
3. If necessary, remove air from oleo chamber by depressing air valve core pin in the inspection hole on top of wing. After pressure in the oleo chamber has diminished, remove valve core pin and attach a small hose to air valve. Drain fluid by slowly compressing piston tube. To extract more fluid from the chamber, remove filler plug, insert siphon hose, and drain fluid from upper area of housing.
4. Remove fairing from around cylinder housing.
5. Remove access plate on bottom of wing, rear of housing, by removing attaching screws.

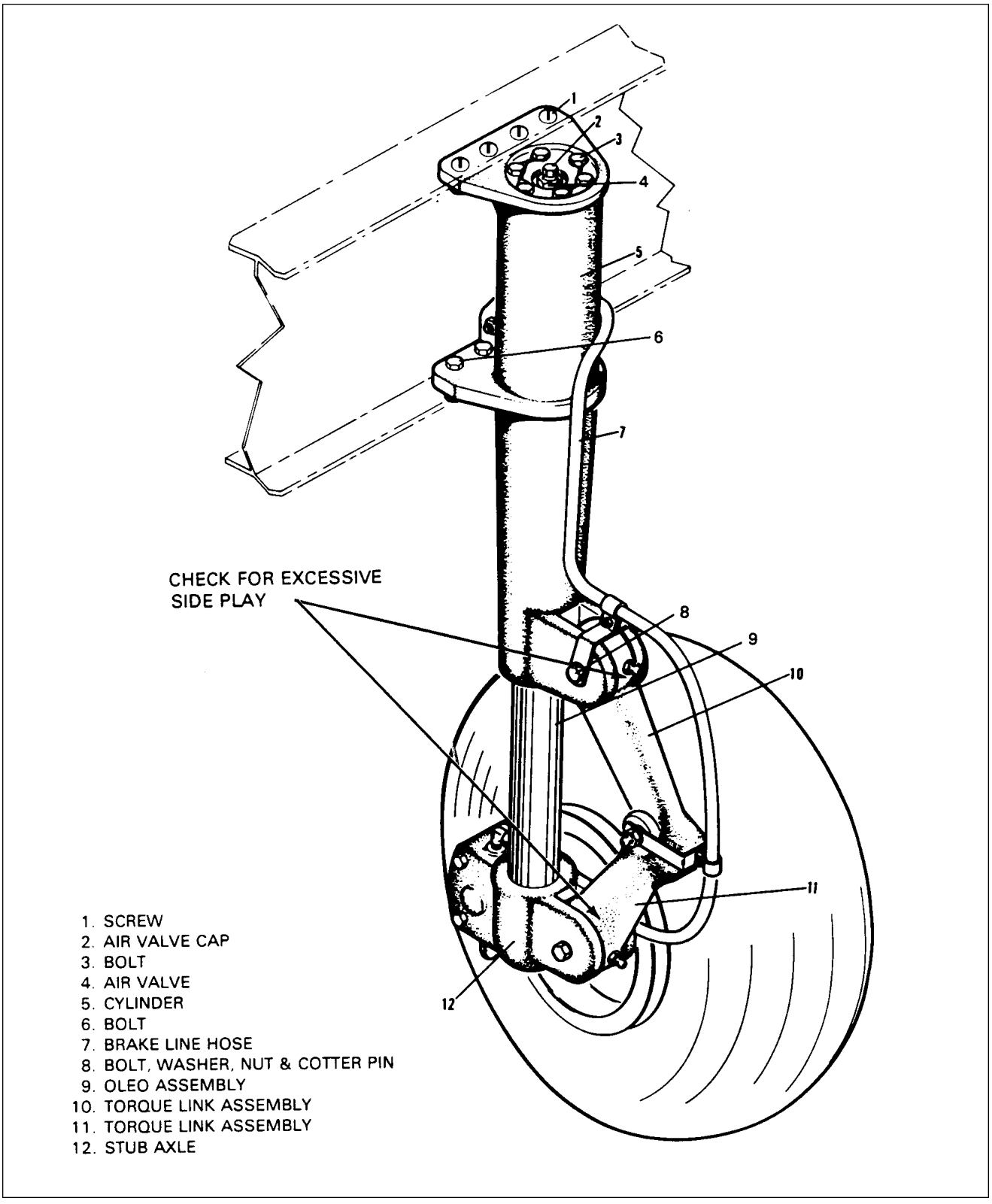


Figure 32-3. Main Gear Installation

6. Unhook hydraulic brake line inside wing assembly (accessible through the access plate). Cap line by using a threaded cap or wrapping with plastic.
7. Remove top four bolts (hold bolts with slotted screwdriver and turn nut with wrench). Remove remaining six bolts with a wrench. Carefully remove gear assembly from wing.

E. CLEANING, INSPECTION AND REPAIR OF MAIN LANDING GEAR

—NOTE—

Landing gear repair is limited to reconditioning parts, parts replacement, smoothing out minor nicks and scratches, and repainting where chipped or peeled.

1. Clean all parts with suitable dry type cleaning solvent.
2. Inspect gear components for excessive wear, corrosion, and damage. Check cylinder housing and torque links for cracks, nicks, and misalignment.

— NOTE —

Main gear cylinders used on the Archer II were cast. Cylinders used on the Archer III are forged. Forged cylinders are available as replacement for the Archer II models.

3. Use a 10 power glass to visually check cast gear cylinder top and bottom radii at drag link attach lugs for cracks. If no cracks found by visual inspection, use dye penetrant procedure to check for cracks. Refer to Chapter 20, Section 20-10-00.

F. INSTALLATION OF MAIN LANDING GEAR. (Refer to Figure 32-3.)

1. Install main landing gear as follows:
   a. Position gear up in wing through access opening, secure with bolts, washers, and nuts.
   b. Connect brake line at point of disconnection.
2. Service oleo strut. (Refer to Chapter 12.)
3. Service brake system. (Refer to Chapter 12.)
4. Install access plate to bottom of wing.
5. Install oleo housing fairing to gear.
6. Remove drip pan from under gear and remove airplane from jacks.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

NOSE GEAR

A. DISASSEMBLY OF NOSE GEAR OLEO (Refer to Figure 32-4.)

—NOTE—

Remove and disassemble the nose gear oleo strut assembly from strut housing with gear removed from or installed on airplane.

1. Remove lower engine cowling. (Refer to Chapter 71.)
2. Place airplane on jacks. (Refer to Chapter 7.)
3. Place drip pan under nose gear to catch spillage.
4. To remove air from strut, depress air valve core pin at top of strut assembly. After pressure in strut chamber has diminished, remove valve core pin, and attach a small hose to air valve. Drain fluid by slowly compressing piston tube. To extract more fluid from strut chamber, remove filler plug, insert siphon hose, and drain fluid from upper area of housing.
5. To remove strut assembly from strut housing, cut safety wire at top of housing that secures steering horn attaching bolt to tube retainer nut. Remove steering horn attaching bolts to release steering horn from top of strut housing.

—NOTE—

It may be necessary to tap top of fork with a plastic mallet to get strut assembly out of housing.

6. Loosen strut assembly retainer nut that secures strut assembly in strut housing. (At the same time, slide strut assembly out through bottom of strut housing.) Remove nut and washer from top of strut housing after assembly is removed.
7. If necessary, remove top and bottom bearing from strut housing. (The bearings are compressed into place, and light tapping may be needed to free them.)
8. Remove piston tube and fork assembly from cylinder as follows:
   a. Separate upper and lower torque links by removing connecting nut, washer, and bolt.
   b. Compress piston tube and fork assembly slightly and remove retainer ring from annular slot in bottom of cylinder tube.
   c. Remove piston tube and fork assembly by sliding out from the bottom of the cylinder tube.
9. Remove bearing assembly from piston tube as follows:
   a. Release snap ring from top of piston tube.
   b. Slide bearing assembly off the end.
   c. If necessary carefully remove wiper strip, back-up washer, and quad ring from inside of bearing sleeve, and the O-ring gasket from outside of bearing sleeve.
10. Remove piston tube plug with O-ring in the lower end of the tube as follows:
    a. Remove nose wheel from fork. (Refer to removal and disassembly of nose wheel.
    b. Loosen and remove bolt, washer and nut that extends through piston tube and block assembly.
    c. Push plug through top of piston tube. Use a rod inserted through tube bottom.

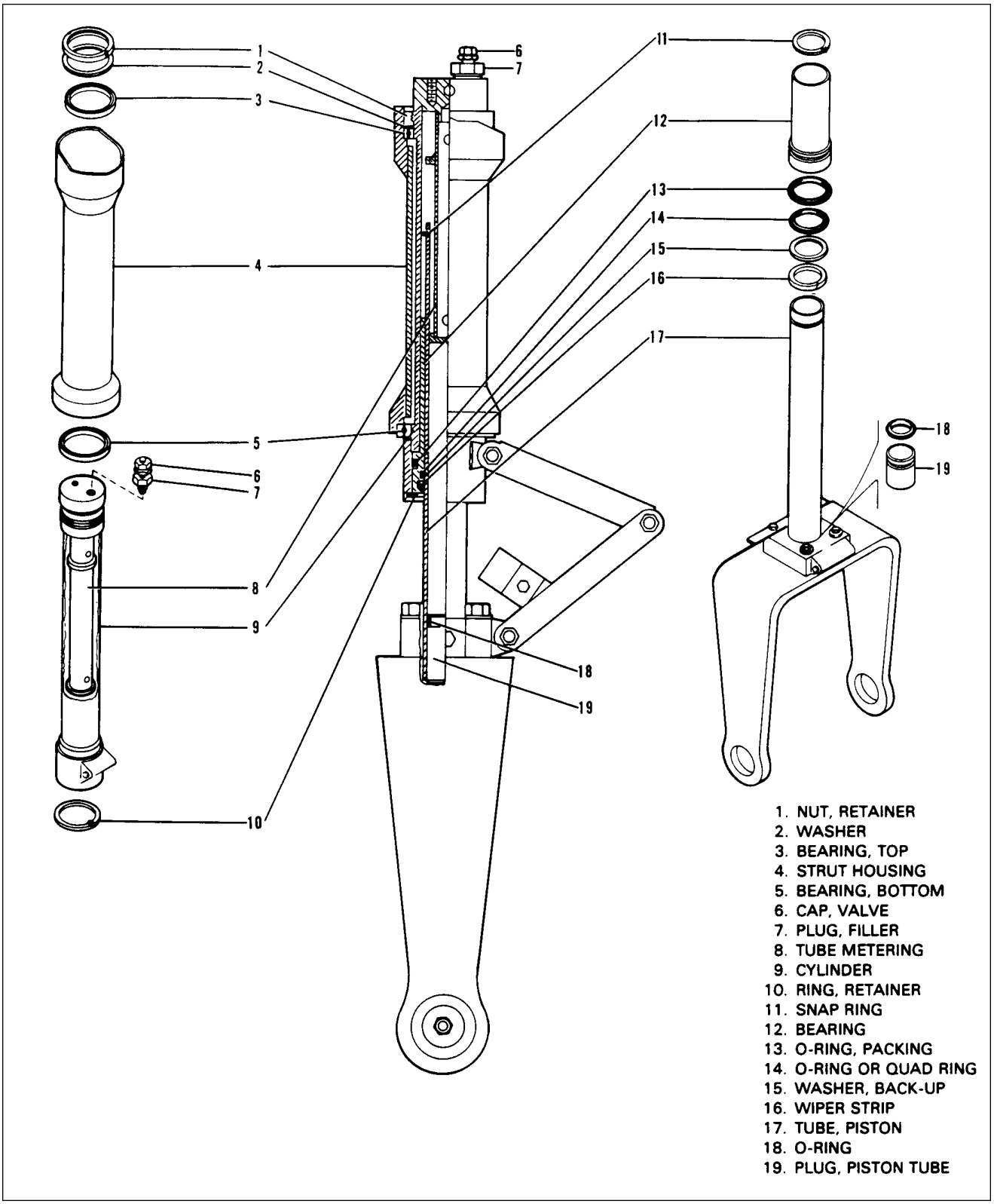


Figure 32-4. Nose Gear Oleo Strut Assembly

B. CLEANING, INSPECTION, AND REPAIR OF NOSE GEAR OLEO

—NOTE—

Repair of oleo is limited to smoothing out minor scratches, nicks and dents, and parts replacement.

1. Clean all parts with a suitable dry type cleaning solvent.
2. Inspect landing gear oleo assembly component for the following:
   a. cylinder tube assembly for corrosion, scratches, nicks, and excessive wear.
   b. lock rings for cracks, burrs, and wear.
   c. fork assembly for corrosion, scratches, nicks, and misalignment.
   d. link assembly for elongated holes, cracks, corrosion, scratches, nicks, and straightness.
   e. general condition of air valve.

C. NOSE GEAR OIL ORIFICE RETAINER RING INSTALLATION (Refer to Figures 32-4 and 32-6.)

—NOTE—

A special tool can be made to simplify installation of the new retainer ring. (Refer to Figure 32-5.)

1 With piston tube and fork removed from cylinder, verify all traces of the old retainer ring are removed from metering tube.
2. Using the tool, position new retainer ring on end of tool with locating stud.
3. Insert tool into cylinder with centering stud positioned into hole in base of metering tube.
4. Hold tool tightly against metering tube and slide sleeve of tool towards metering tube. (This will move new retainer ring over end of metering tube and position itself into groove of metering tube.)

D. ASSEMBLY OF NOSE GEAR OLEO (Refer to Figure 32-4.)

1. Verify all parts are cleaned and inspected.
2. Install piston tube plug as follows:
   a. Lubricate tube plug and O-ring with hydraulic fluid (MIL-H-5606) and install O-ring on plug.
   b. Lubricate inside wall of piston tube, and insert plug into top of tube, pushing it to the fork end.
   c. Align bolt holes of fork, tube, and plug; install the bolt, washer, and nut.
3. Carefully install, in bearing sleeve, quad ring, back-up washer, and wiper strip. Slide O-ring in place on outside of sleeve.
4. Lubricate bearing assembly and carefully install on piston tube.
5. Position snap ring on upper end of piston tube.
6. Insert piston tube, with bearing assembly, in cylinder tube. Secure with retainer ring in annular slot at bottom of tube.
7. Connect torque links on tube and fork, securing with bolt, washer, and nut. Tighten nuts only tight enough to retard side play, allowing links to rotate freely.
8. Verify that upper and lower bearings are installed in strut housing. (Bearings are a press fit with grooves in the inner and outer races in the up position.)

9. Position washer and strut assembly retainer nut on top of strut housing. Insert strut assembly up through washer until it contacts nut. Tighten nut to fit snug.
10. Install steering horn assembly as follows:
    a. Insert hex bolt through side of horn and top of strut assembly. When it protrudes through the other side of steering horn, install washer and nut.
    b. Install steering horn attaching bolt through top of horn into strut assembly. Do not tighten bolt at this time. (If space appears between steering horn plate and top of strut assembly, install spacer washer(s), (AN960416L), between horn and strut.)
    c. Tighten bolt, and safety bolt to strut assembly retainer nut with MS20995C40 wire.
11. Compress and extend strut several times to verify that strut operates freely. The weight of the gear wheel and fork should allow strut to extend.
12. Service oleo strut with fluid and air. (Refer to Chapter 12.)
13. Check gear for alignment. (Refer to alignment of nose landing gear.)

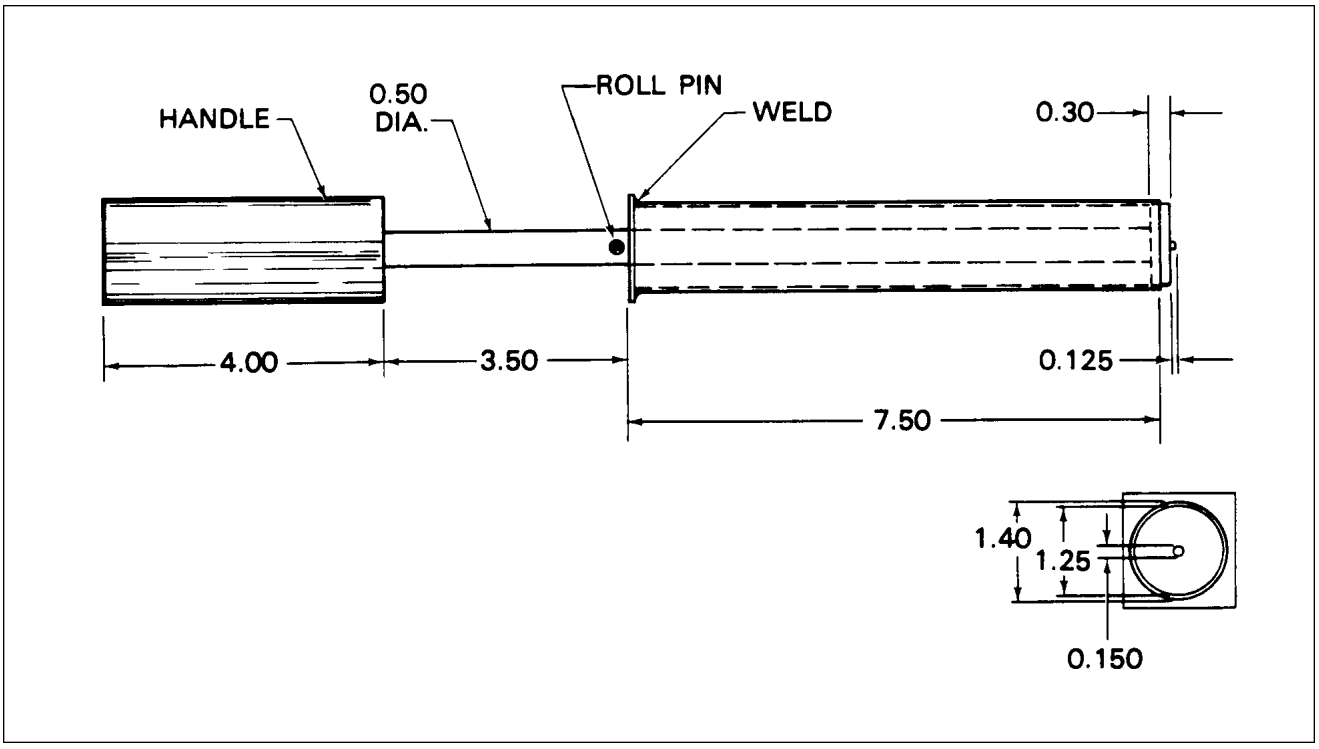


Figure 32-5. Retainer Ring Tool

THIS SPACE INTENTIONALLY LEFT BLANK

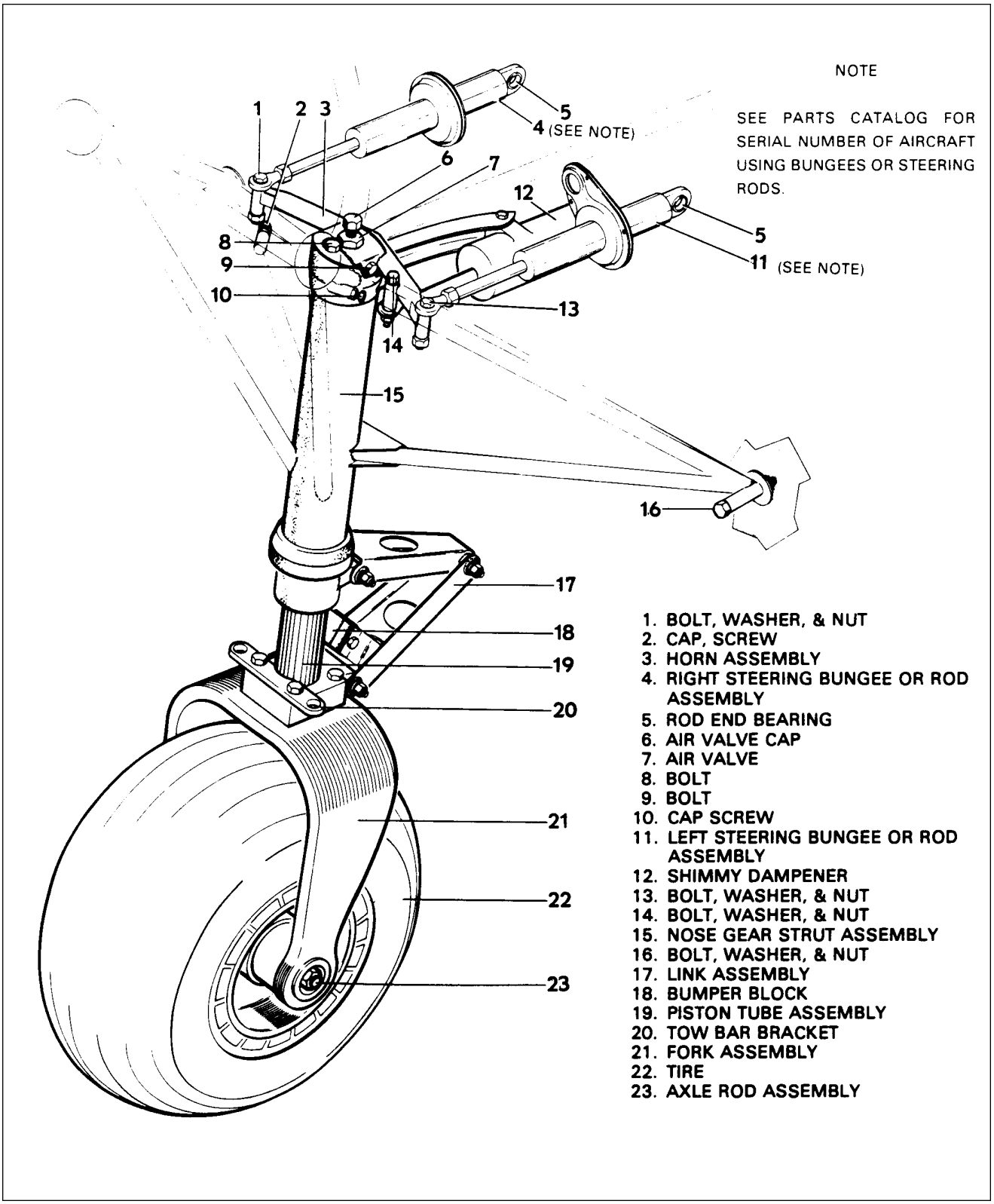

NOTE
SEE PARTS CATALOG FOR SERIAL NUMBER OF AIRCRAFT USING BUNGEES OR STEERING RODS.
1. BOLT, WASHER, & NUT
2. CAP, SCREW
3. HORN ASSEMBLY
4. RIGHT STEERING BUNGEE OR ROD ASSEMBLY
5. ROD END BEARING
6. AIR VALVE CAP
7. AIR VALVE
8. BOLT
9. BOLT
10. CAP SCREW
11. LEFT STEERING BUNGEE OR ROD ASSEMBLY
12. SHIMMY DAMPENER
13. BOLT, WASHER, & NUT
14. BOLT, WASHER, & NUT
15. NOSE GEAR STRUT ASSEMBLY
16. BOLT, WASHER, & NUT
17. LINK ASSEMBLY
18. BUMPER BLOCK
19. PISTON TUBE ASSEMBLY
20. TOW BAR BRACKET
21. FORK ASSEMBLY
22. TIRE
23. AXLE ROD ASSEMBLY

Figure 32-6. Nose Gear Installation

E. REMOVAL OF NOSE LANDING GEAR (Refer to Figure 32-6.)

1. Remove engine cowling. (Refer to Chapter 71.)
2. Remove propeller. (Refer to Chapter 61.)
3. Place airplane on jacks. (Refer to Chapter 7.)
4. Remove engine. (Refer to Chapter 71.)
5. Disconnect the two steering bungee or rod assemblies at nose gear horn assembly by removing cotter pins, nuts washers, and bolts.
6. Disconnect oil lines, vacuum lines, fuel lines, hoses and wires secured to the mount with clamps and Koroseal lacing. Mark all wires and lines to aid installation.
7. Remove nose gear and engine mount by removing the five bolts holding mount to firewall.

F. CLEANING, INSPECTION, AND REPAIR OF NOSE LANDING GEAR

—CAUTION—

The shimmy damper requires no service other than routine inspection. In case of damage or malfunction, damper must be replaced. Do not repair damper.

—CAUTION—

Repair to landing gear is limited to reconditioning of parts, such as replacing bearings and bushings, smoothing out minor nicks and scratches, repainting where paint has chipped or peeled, and replacement of parts.

1. Clean all parts with a suitable dry type cleaning solvent.
2. Inspect nose gear assembly for the following:
   a. Bolts, bearings, and bushings for excess wear, corrosion, and damage.
   b. Strut housing and torque links for cracks, bends, or misalignment.

G. INSTALLATION OF NOSE LANDING GEAR (Refer to Figure 32-6.)

1. Install nose gear and engine mount assembly to firewall with bolts, washers, and nuts. Tighten nuts to a torque of 240 - 270 inch pounds.
2. Attach two steering bungee or rod assemblies to nose gear steering horn with bolts, washers, and nuts.
3. Connect shimmy damper to steering horn with bolts, washers, and nuts. (A spacer bushing and cotter pin are required at the body attachment point.)
4. Install engine and connect controls. (Refer to Chapter 71.)
5. Attach hoses, wires, and cables to engine mount tubing, secure with clamps and Koroseal lacing where required.
6. Check nose gear alignment. (Refer to alignment of nose gear.)
7. Remove airplane from jacks.
8. Install propeller (refer to Chapter 61) and engine cowling (refer to Chapter 71).

H. ALIGNMENT OF NOSE GEAR

1. Place airplane on a smooth, level floor.
2. Place airplane on jacks. (Refer to Chapter 7.)
3. Level airplane laterally and longitudinally. (Refer to Chapter 8.)
4. From center of tail skid, extend a plumb bob and mark the contact point on the floor.
5. Extend a chalk line from floor mark below tail skid, to a point approximately three feet forward of the nose wheel. Allow the line to pass under the wheel at the centerline of the tire. Snap the chalk line.
6. Verify rudder is properly rigged and rudder cable tension is correct. (Refer to Chapter 27.)
7. Clamp rudder pedals to align in a lateral position. (Refer to Figure 32-7.)
8. Verify nose wheel is in alignment with longitudinal axis of airplane or chalk line.
9. Install steering bungee assemblies between steering horn and rudder pedals without any load on bungees. Adjust rod ends to obtain a no load condition. Connect bungees to steering horn.

—NOTE—

Check rod ends have sufficient thread engagement. Use check hooks in the rods or verify a minimum three-eighths of an inch thread engagement.

10. Verify rudder pedal stops are adjusted per instructions in Chapter 27.
11. Check nose gear steering for maximum right and left travel as follows:
    a. Mark (on each side of the nose wheel) an angle line from the center line and wheel pivot point. (Refer to chart 3202 for nose wheel turning angle.)
    b. Turn wheel to its maximum travel in both directions to check for allowable travel. If travel is too great in one direction and not enough in the other direction, check for possible damage to gear fork or torque links.
12. Adjust horn stops to contact horn when nose wheel is turned 30° ± 1° right and left from center.
13. Adjust shimmy dampener by turning nose wheel against stops and adjusting the rod end of dampener for adequate travel to both directions.
14. Remove airplane from jacks.

CHART 3202. NOSE GEAR ALIGNMENT TOLERANCES

Rudder Pedal Neutral Angle (Aft of Vertical)	14 degrees	+ 3° -1°
Nose Wheel Travel	30 degrees left, 30 degrees right	 +1° -1°

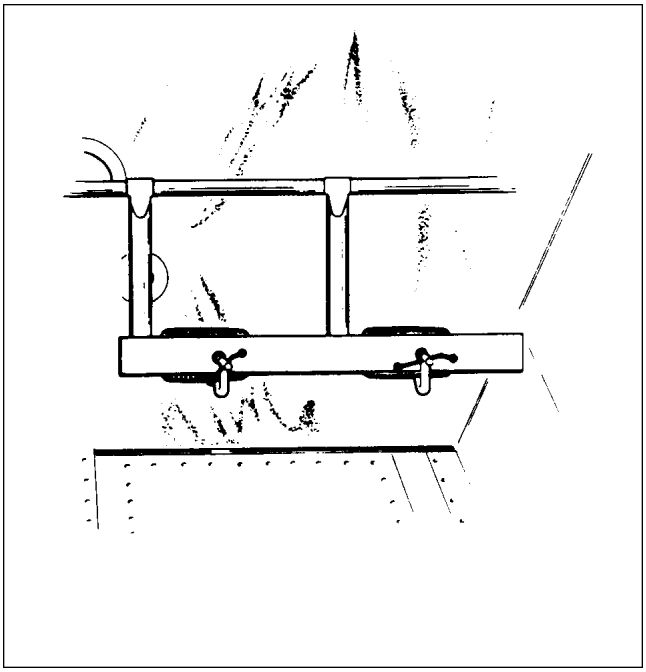


Figure 32-7. Clamping Rudder Pedals in Neutral Position

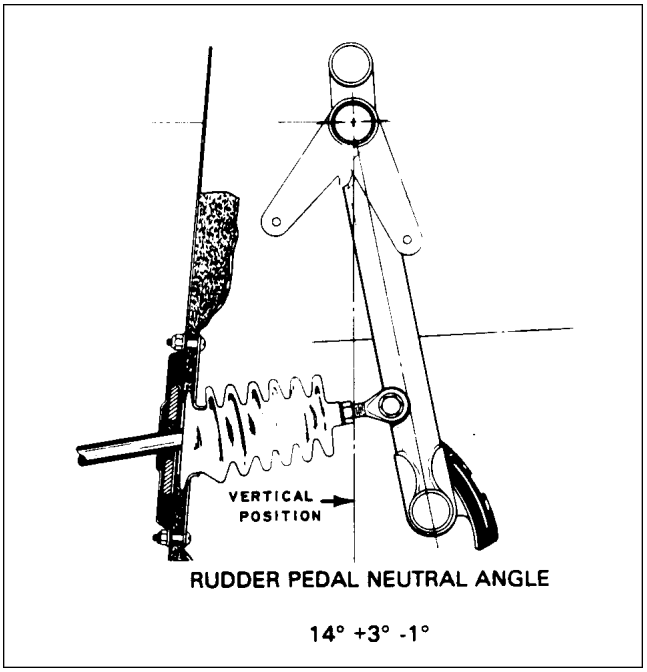


Figure 32.8. Rudder Pedals at Neutral Angle

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

WHEELS AND BRAKES

A. REMOVAL AND DISASSEMBLY OF MAIN WHEEL (Refer to Figure 32-9.)

1. Place airplane on jacks. (Refer to Chapter 7.)
2. If the wheel fairing is installed, remove the two fairing attachment bolts on each side of fairing and remove the small plate on top of fairing. Slide wheel fairing up gear fairing.
3. To remove main wheel, remove the two cap bolts that join the brake cylinder housing and lining back plate assemblies. Remove back plate from between brake disc and wheel.
4. Remove dust cover, cotter pin, and flat head pin that safeties the wheel nut, and remove the wheel nut. Slide wheel from axle.
5. Separate the wheel halves by first deflating the tire. With tire sufficiently deflated, remove wheel through bolts. Pull wheel halves from tire by removing the inner half from tire first, then remove outer half.
6. Remove wheel bearing assemblies from each wheel half by first removing retainer rings or snap rings holding the grease seal retainers, then the retainers, grease seals, and bearing cone. Bearing cups must be removed for replacement only. Remove by tapping them out evenly from the inside.

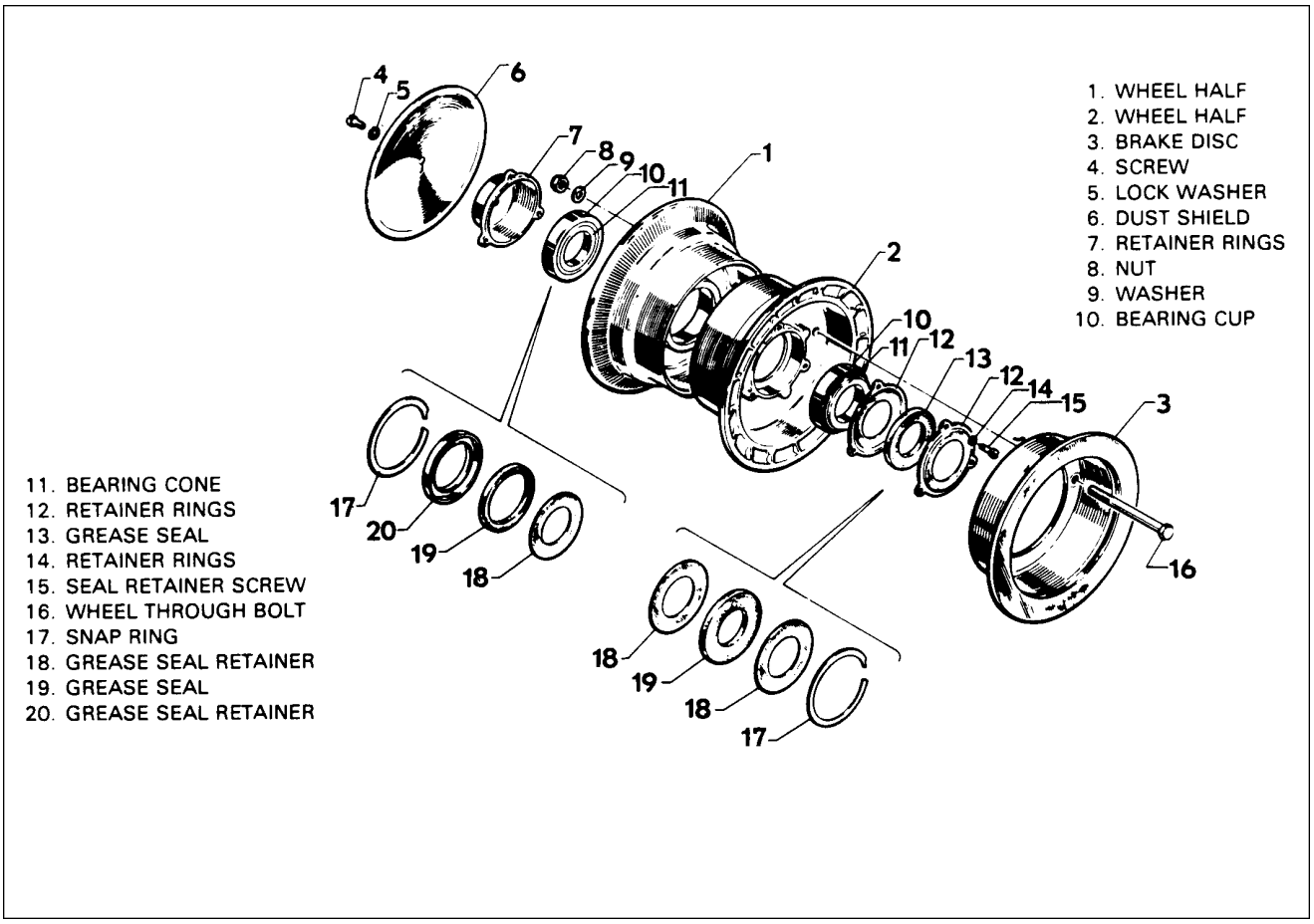


Figure 32-9. Main Wheel Assembly

B. INSPECTION OF MAIN WHEEL ASSEMBLY

1 Visually check all parts for cracks, distortion, defects, and excess wear.
2. Check tie bolts for looseness or failure.
3. Check internal diameter of felt grease seals. Replace felt grease seal if surface is hard or gritty.
4. Check tire for cuts, internal bruises, and deterioration.
5. Check bearing cones and cups for wear and pitting, and relubricate.
6. Replace any wheel casting with visible cracks.

C. ASSEMBLY AND INSTALLATION OF MAIN WHEEL (Refer to Figure 32-9.)

1. Verify bearing cup for each wheel is properly installed. Install tire with tube on outer wheel half and join the two wheel halves. Position brake disc in the inner wheel half and install through bolts with the nuts on valve stem side. Tighten wheel nuts to a torque of 150 inch-pounds and inflate tire. (Refer to chapter 91.)
2. Lubricate bearing cones, and install the cones, grease seals, and seal retainer rings. Secure with retainer rings or snap ring.
3. Slide wheel on axle and secure with retainer nut. Tighten nut to allow no side play. (Allow wheel to rotate freely.) Safety the nut with flat head pin, washer, and cotter pin. Install dust cover.
4. Position brake lining back plates between wheel and brake disc and the brake cylinder on torque plate. Insert spacer blocks between back plates and cylinder, and install four bolts to secure assembly. If brake line was disconnected, connect the line and bleed brakes. (Refer to bleeding brakes.)

D. REMOVAL AND DISASSEMBLY OF NOSE WHEEL (Refer to Figure 32-10.)

1. Jack airplane so nose wheel is clear of the ground. (Refer to Chapter 7.)
2. If wheel fairing is installed, remove four bolts, two on each side, and the small plate on top held by metal screws. Slide fairing up gear until wheel is removed.
3. Remove wheel as follows:
   a. Remove nut and washer from one end of axle rod and slide out rod and axle plugs.

—CAUTION—

Do not damage axle tube end in any way. This will make removal and installation extremely difficult.

   b. Lightly tap axle tube out from the center of wheel assembly with an object of near equal diameter.
   c. Remove spacer tubes and wheel assembly.
   d. Slide down wheel fairing and remove by turning it sideways.
4. Separate wheel halves by first deflating tire. With tire sufficiently deflated, remove wheel through bolts. Pull wheel halves from tire by removing wheel half opposite valve stem first and then the other half.
5. Remove wheel bearing assemblies from each wheel half by removing three screws or snap ring holding the grease seal and seal retainers, and then the bearing cones. Remove bearing cup by tapping out evenly from the inside.

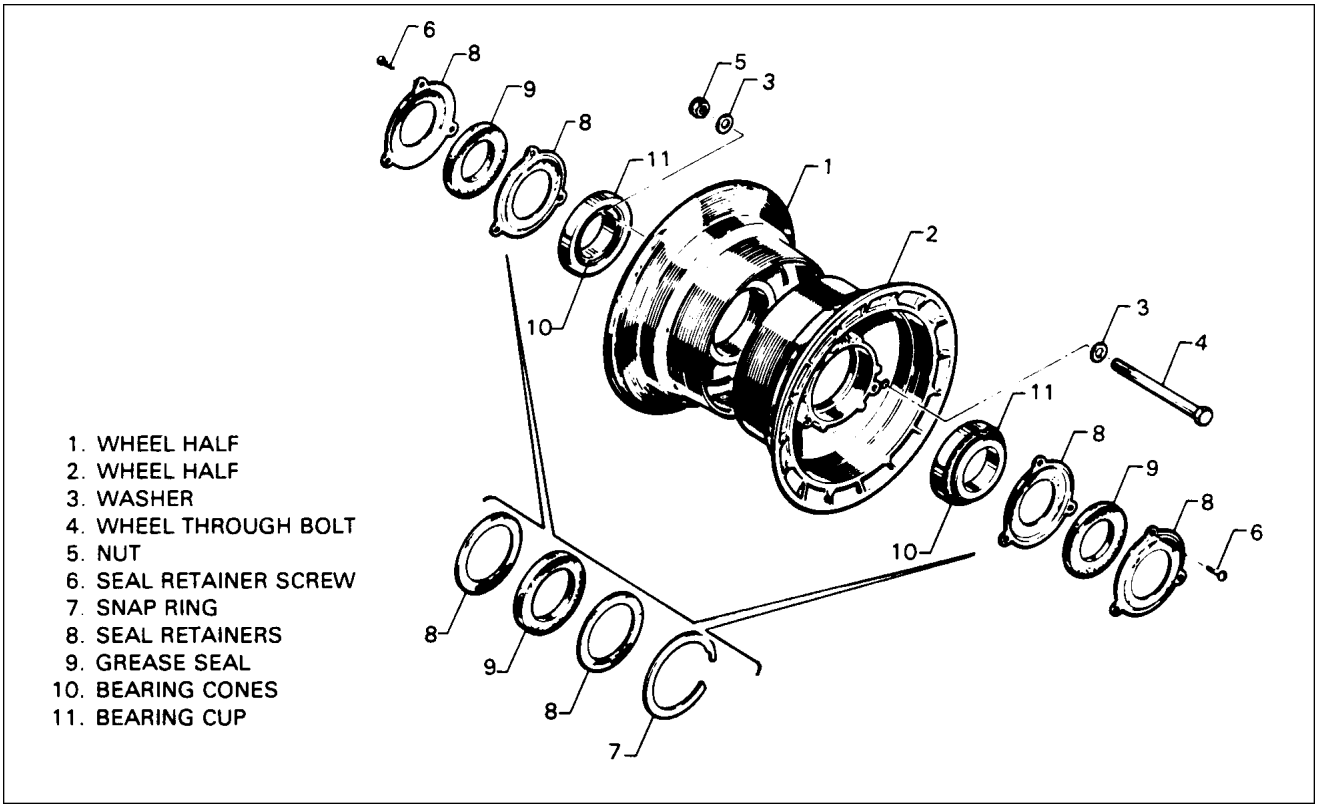


Figure 32-10. Nose Wheel Assembly

E. INSPECTION OF NOSE WHEEL ASSEMBLY

1. Visually check all parts for cracks, distortion, defects, and excess wear.
2. Check tie bolts for looseness or failure.
3. Check internal diameter of felt grease seals. Replace felt grease seal if surface is hard or gritty.
4. Check tire for cuts, internal bruises, and deterioration.
5. Check bearing cones and cups for wear and pitting, and relubricate.
6. Replace any wheel casting having visible cracks.

F. ASSEMBLY AND INSTALLATION OF NOSE WHEEL (Refer to Figure 32-10.)

1. Verify bearing cup for each wheel half is properly installed. Install tire with tube on the wheel half with the valve stem hole and join the two wheel halves. Install through bolts with washers and nuts to valve stem side . Tighten nuts to a torque of 90 inch-pounds and inflate tire. (Refer to Chapter 91 .)
2. Lubricate bearing cones and install cones and grease seal assembly. Secure with the three screws or snap ring.
3. Replace wheel fairing by turning sideways and slipping it up over fork assembly.
4. Place spacer tubes one on each side of wheel and install unit in fork. Align and slide axle tube through spacer tubes and wheel assembly. Install axle plugs and rod with washer and nut. Tighten nuts until no side play is felt. (Allow wheel to rotate freely.)
5. Turn fairing so it will fall into place. Install it with the four bolts and screws in the small plate.

G. BRAKE ADJUSTMENT AND LINING TOLERANCE

The brake lining clearance is self-adjusting. Visually inspect the lining (it may be inspected visually while installed on the airplane). Linings are the riveted type and must be replaced if the thickness of any segment becomes worn below 0.099 inch or unevenly worn.

H. REMOVAL AND DISASSEMBLY OF BRAKE ASSEMBLY (Refer to Figure 32-11.)

1. Disconnect brake line from brake cylinder at the tube fitting.
2. Remove two cap bolts that join brake cylinder housing and lining back plate assembly. Remove back plate from between brake disc and wheel.
3. Slide brake cylinder housing from torque plate.
4. Remove pressure plate by sliding it off the anchor bolts of the housing.
5. Remove piston by injecting low air pressure in cylinder fluid inlet and forcing piston from the housing.
6. Check anchor bolt for wear.
7. Remove anchor bolt as follows:
   a. Position cylinder assembly on a holding fixture. (Refer to Figure 32-12.)
   b. Use a suitable arbor press to remove anchor bolt from cylinder body.
8. Install anchor bolt as follows:
   a. Support anchor bolt in a holding fixture. (Refer to Figure 32-12, Step A.)
   b. Align cylinder body over anchor bolt. (Refer to Figure 32-12, Step B.)
   c. Use a suitable arbor press and apply pressure on the spot face directly over anchor bolt hole. (Refer to Figure 32-12, step C.)

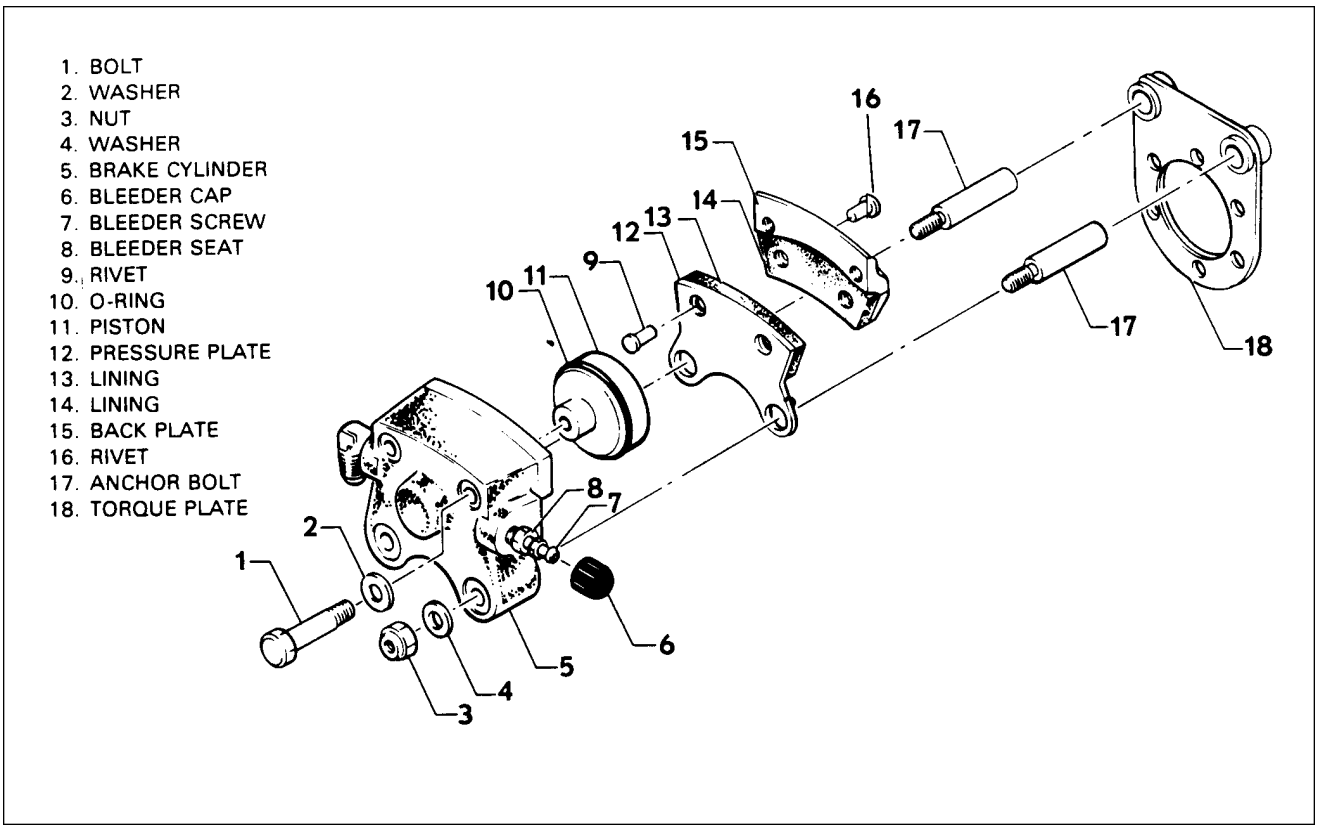


Figure 32-11. Brake Assembly

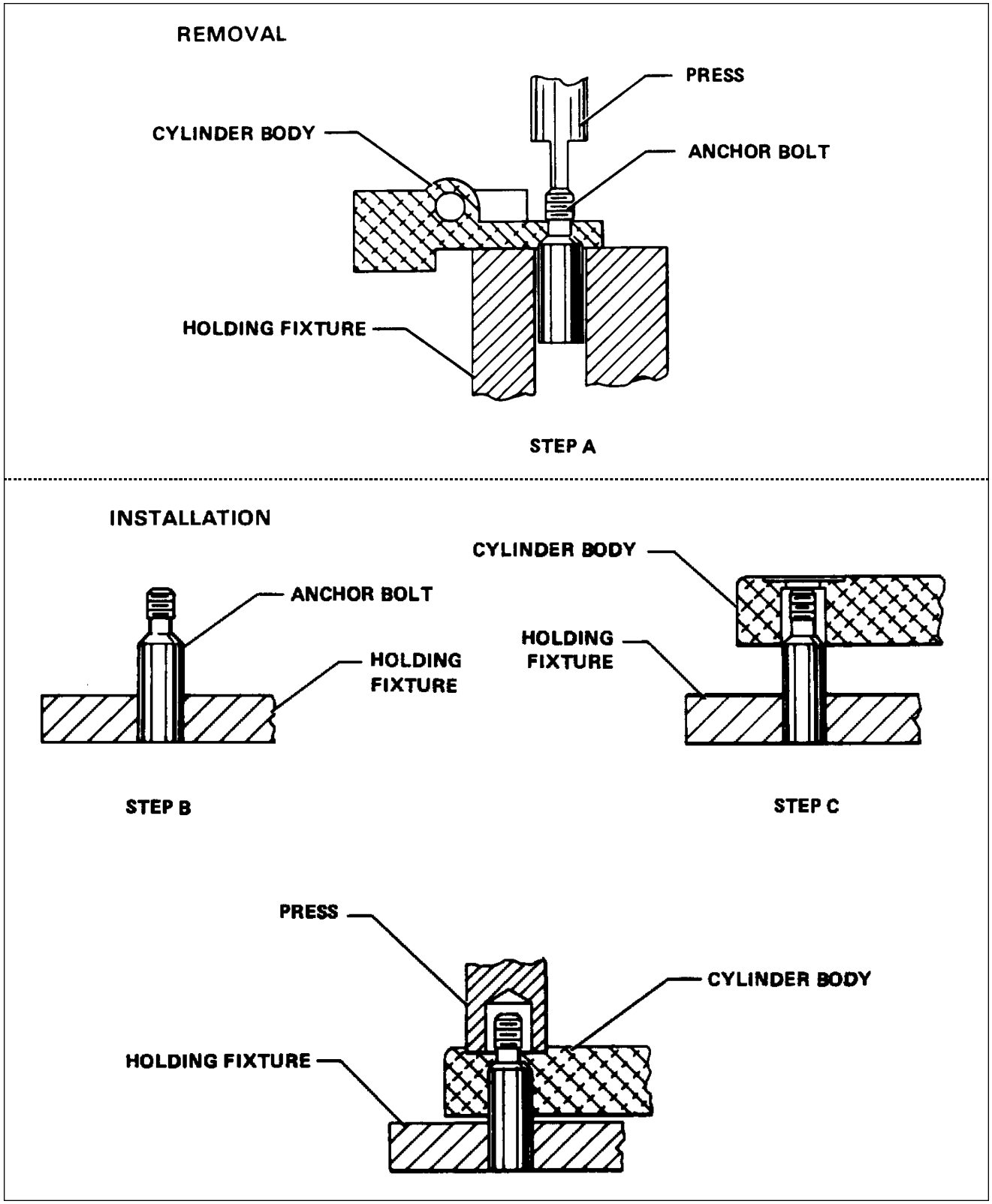


Figure 32-12. Removal and Installation of Anchor Bolts

I. CLEANING, INSPECTION, AND REPAIR OF BRAKE ASSEMBLY

1. Clean assembly with a suitable solvent and dry thoroughly.
2. Check cylinder housing wall and piston for scratches, burrs, corrosion, etc. that will damage O-rings.
3. Check general condition of the brake bleeder screw and lines.
4. Check brake disc for grooves, scratches, pits, or coning. Coning beyond 0.015 inch in either direction will require replacement. Minimum thickness of disc 164-20 used on wheel assembly 40-86B is 0.205 inch. (Refer to figure 32- 13.) A single groove or isolated grooves up to 0.031 inch deep will not require replacement. Grooving of the entire surface will reduce lining life and must be replaced. If a powdery rust appears on brake disc, one or two taxi-braking applications should clear it up. If rust is heavier, remove the disc for wire brushing, and sand with 220 grit sandpaper. To remove wheel disc, refer to removal and disassembly of main wheel.
5. Remove lining from backing plates by drilling or punching out the old rivets, and installing a new set. Use the proper rivets and a rivet set that will properly stake the lining and form a correct flare of the rivet. (A rivet setting kit is available through Piper dealers as part number 754 165.)
6. After new linings are installed, condition as follows:

   Perform a minimum of six light pedal effort braking applications from 25 to 40 mph, allowing brake discs to partially cool between stops.

J. ASSEMBLY AND INSTALLATION OF BRAKE ASSEMBLY (Refer to Figure 32-11.)

1. Lubricate piston O-ring with fluid MIL-H-5606 and install on piston. Slide piston in cylinder housing until flush with housing surface.
2. Slide lining pressure plate onto anchor bolts of housing.
3. Slide cylinder housing assembly on the gear torque plate.
4. Position lining back plate between wheel and brake disc. Install the two bolts to secure assembly.
5. Connect brake line to brake cylinder housing.
6. Bleed brake system. (Refer to bleeding brakes.)

K. REMOVAL OF BRAKE MASTER CYLINDER (HAND BRAKE) (Refer to Figure 32-14.)

1. Disconnect inlet supply line from the fitting at the top of cylinder and drain fluid from reservoir and line into a suitable container.
2. Disconnect pressure line from the fitting on cylinder and drain fluid from cylinder line.
3. Disconnect the end of cylinder rod from brake handle by removing cotter pin that safeties the connecting clevis pin. Remove clevis pin and spacer washers.
4. Disconnect base of cylinder from mounting bracket by removing attaching bolt assembly.
5. Remove handle assembly by removing attaching bolt assembly holding handle to mounting bracket.

L. DISASSEMBLY OF BRAKE MASTER CYLINDER

1. Remove cylinder from mounting bracket.
2. To disassemble cylinder, remove piston rod assembly by removing snap ring from the annular slot at the rod end of cylinder. Draw piston rod assembly from cylinder.
3. Disassemble piston rod assembly by removing small snap ring securing the retainer bushing, spring, piston, seal, gland, and the large retainer spring.
4. Remove O-rings from piston and gland.

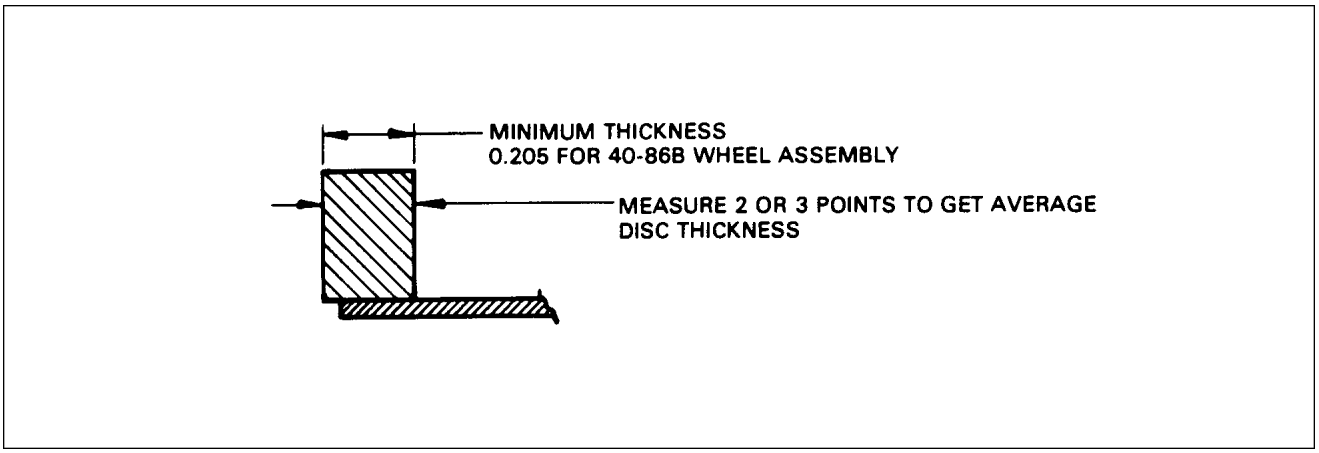


Figure 32-13. Brake Disc Minimum Thickness

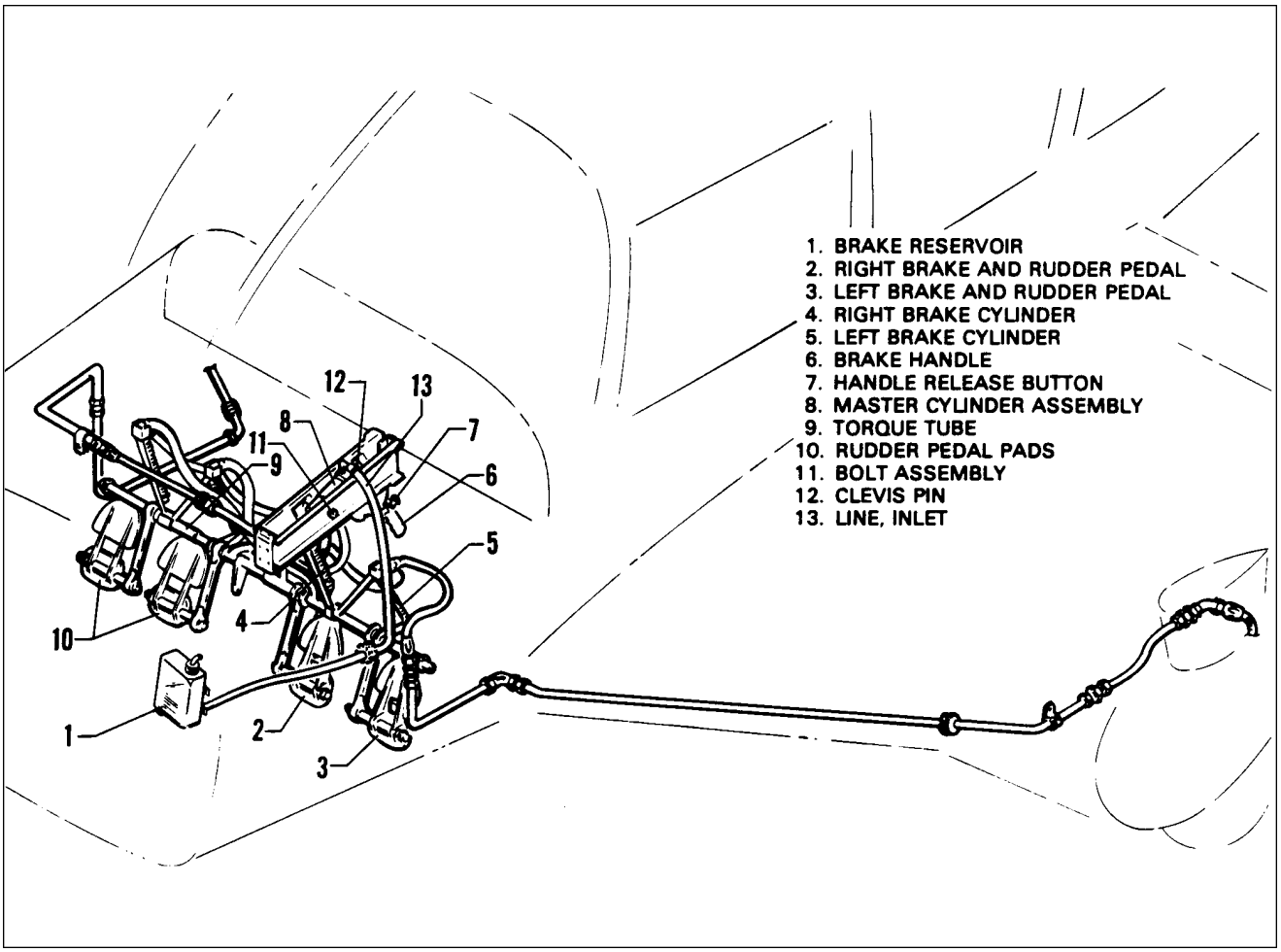


Figure 32-14. Brake System Installations

M. CLEANING, INSPECTION, AND REPAIR OF BRAKE MASTER CYLINDER

1. Clean cylinder parts with a suitable solvent and dry thoroughly.
2. Inspect interior walls of cylinder for scratches, burrs, corrosion, etc.
3. Inspect the general condition of the fitting threads of cylinder.
4. Check piston for scratches, burrs, corrosion, etc.
5. Cylinder repairs are limited to polishing out small scratches, burrs, etc., and O-rings.

N. ASSEMBLY OF BRAKE MASTER CYLINDER

—NOTE—

Use a small amount of hydraulic fluid (MIL-H-5606) on O-ring and component parts to prevent damage and for ease of handling during assembly.

1. Install new O-ring on inside and outside of packing gland and on outside of piston.(Use a cone placed against the piston when installing Teflon O-ring on piston. The cone may be plastic or metal with dimensions per figure 32-15.)
2. To assemble piston rod assembly, install on rod, in order: roll pins, return spring retainer washer, retaining spring, packing gland with O-rings, seal, piston with O-ring, spring, and retainer bushing. Secure with snap ring on rod end.
3. Insert piston rod assembly in housing and secure packing gland with snap ring.
4. Install cylinder. (Refer to installation of brake master cylinder.)

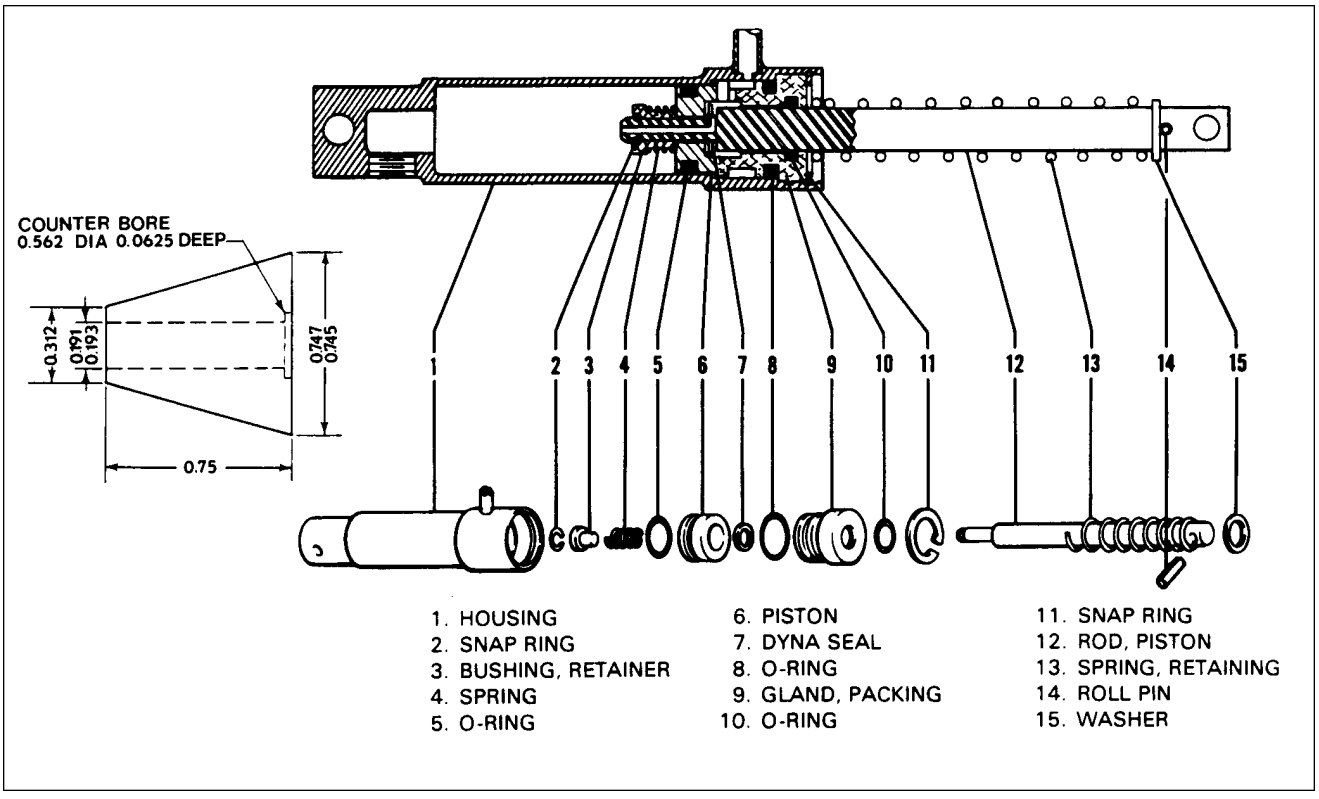


Figure 32-15. Brake Master Cylinder (Hand/Parking Brake)

O. INSTALLATION OF BRAKE MASTER CYLINDER (HAND BRAKE) (Refer to Figure 32-14.)

1. Install brake handle assembly between its mounting bracket and secure with bolt, washers, nut, and cotter pin. Washers must be placed on each side of handle, between the bracket, and under the nut.
2. Place cylinder between mounting bracket and secure base end with bolt, washers, nut, and cotter pin. Place washers on each side of cylinder and under the nut.
3. Connect rod end of cylinder to brake handle with a clevis pin and thin washers. Safety the clevis with a cotter pin.
4. Connect pressure line to fitting at bottom of cylinder.
5. Connect inlet supply line to the fitting at the top of cylinder and secure with spring clamp.
6. Bleed brake system. (Refer to bleeding brakes.)

P. REMOVAL OF BRAKE CYLINDER (TOE BRAKE) (Refer to Figure 32-16.)

1. Disconnect upper and lower lines from cylinder and cap lines to prevent fluid leakage, or drain fluid from brake reservoir and master cylinder.
2. Remove cylinder from its attachment fittings by removing cotter pins that safety the cylinder attaching pins, and removing pins.

Q. DISASSEMBLY OF BRAKE CYLINDER

1. Cleveland cylinder number 10-27. (Refer to Figure 32-17.)
   a. Remove cylinder from its mounting bracket. (Refer to removal of brake cylinder.)
   b. To disassemble cylinder, remove piston rod assembly by removing snap ring from the annular slot in cylinder housing. Draw piston rod assembly from cylinder.
   c. Disassemble piston rod assembly by removing roll pin, then piston assembly, seal, and packing gland.
   d. Remove O-rings from piston and packing gland.
2. Cleveland cylinder number 10-30. (Refer to Figure 32-17.)
   a. Remove cylinder from its mounting bracket. (Refer to removal of brake cylinder.)
   b. To disassemble cylinder, remove piston rod assembly by removing retaining ring from the annular slot in cylinder housing. Draw piston rod assembly from cylinder.
   c. Disassemble piston rod assembly by removing retaining ring, sleeve, spring, piston assembly, O-ring, gland, and, return spring.
   d. Remove O-rings from piston and packing gland.
3. Gar-Kenyon cylinder number 17000. (Refer to Figure 32-17.)
   a. Remove cylinder from its mounting bracket. (Refer to removal of brake cylinder.)
   b. To disassemble cylinder, remove piston rod assembly by unscrewing fitting from cylinder.
   c. Disassemble piston rod assembly by removing retaining ring securing the sleeve, and then removing the spring, piston, seal, fitting, and the large return spring.
   d. Remove O-rings from piston and fitting.

R. CLEANING, INSPECTION, AND REPAIR OF BRAKE CYLINDER

1. Clean cylinder parts with a suitable solvent and dry thoroughly.
2. Inspect interior walls of cylinder for scratches, burrs. corrosion, etc.
3. Inspect general condition of the cylinder fitting threads.
4. Check piston and valve for scratches. burrs, corrosion, etc.
5. Repairs to cylinder are limited to polishing out small scratches, burrs, etc.. and replacing valve, washer, seal. and O-rings.

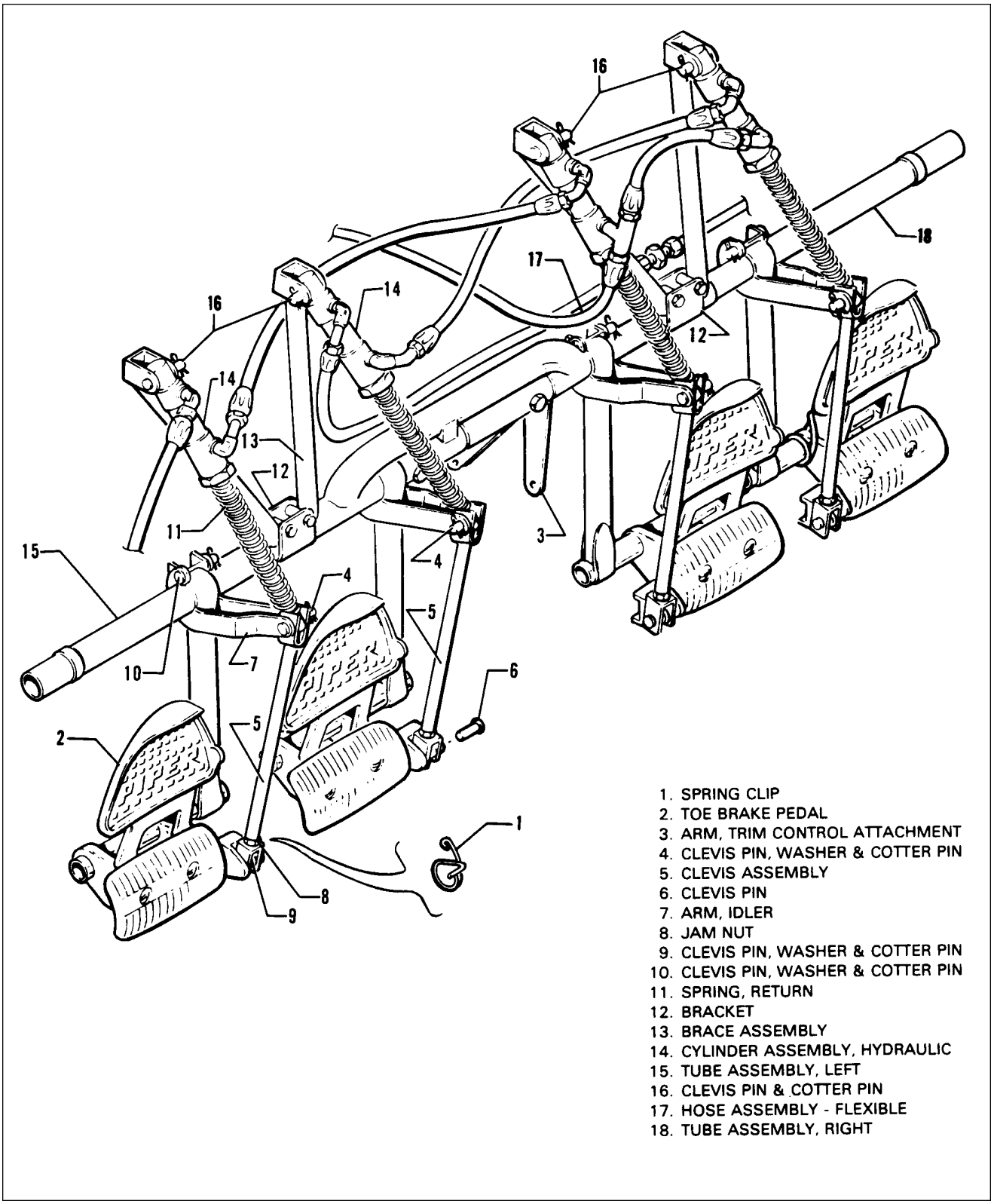

1. SPRING CLIP
2. TOE BRAKE PEDAL
3. ARM, TRIM CONTROL ATTACHMENT
4. CLEVIS PIN, WASHER & COTTER PIN
5. CLEVIS ASSEMBLY
6. CLEVIS PIN
7. ARM, IDLER
8. JAM NUT
9. CLEVIS PIN, WASHER & COTTER PIN
10. CLEVIS PIN, WASHER & COTTER PIN
11. SPRING, RETURN
12. BRACKET
13. BRACE ASSEMBLY
14. CYLINDER ASSEMBLY, HYDRAULIC
15. TUBE ASSEMBLY, LEFT
16. CLEVIS PIN & COTTER PIN
17. HOSE ASSEMBLY - FLEXIBLE
18. TUBE ASSEMBLY, RIGHT

Figure 32-16. Toe Brake Installation

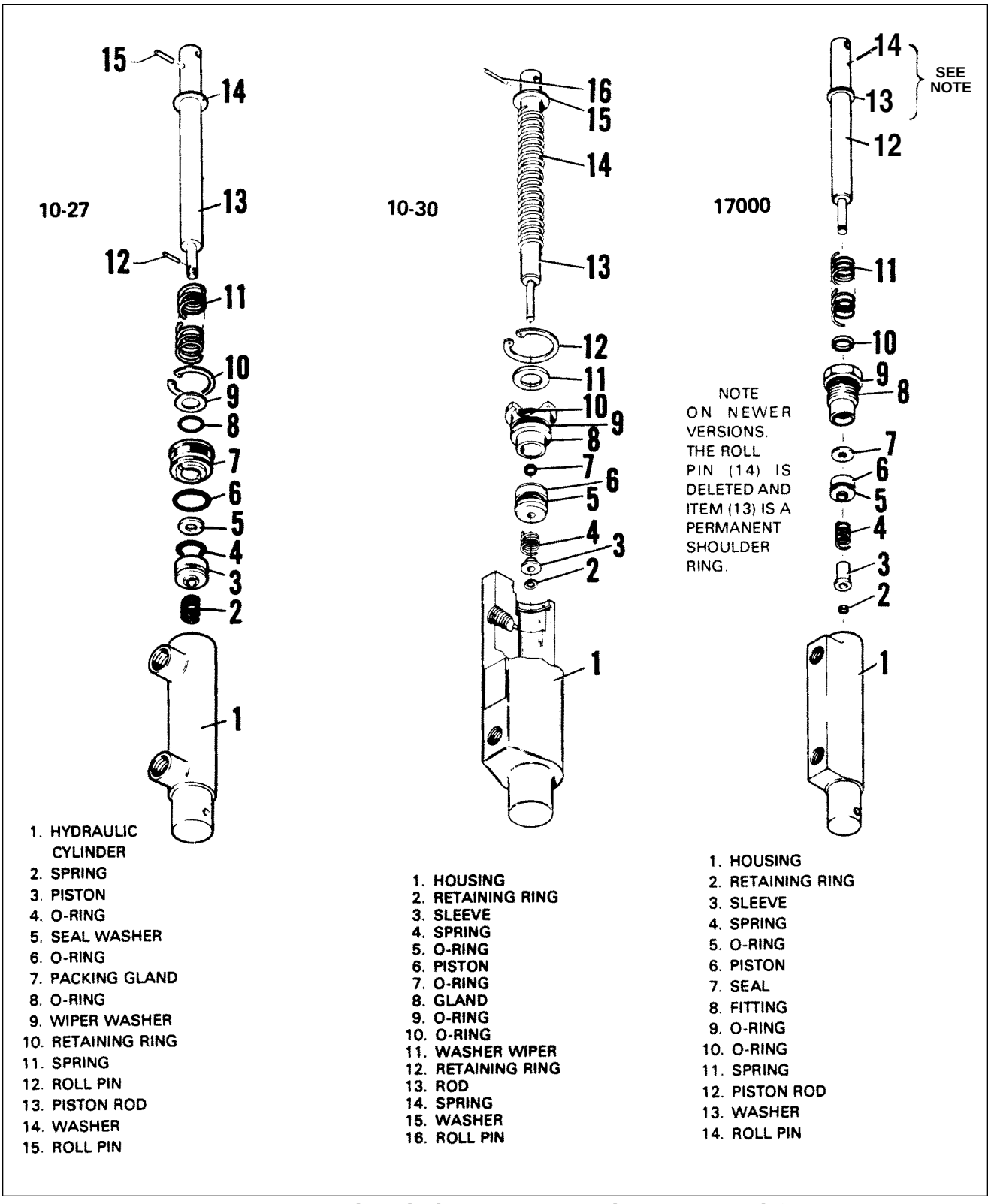


Figure 32-17. Brake Cylinder 10-27, 10-30, and 17000 (Toe Brake)

S. ASSEMBLY OF BRAKE CYLINDER

1. Cleveland cylinder number 10-27. (Refer to Figure 32-17.)

—NOTE—

Use a small amount of hydraulic fluid (MIL-H-5606) on O-ring and component parts to prevent damage, and for ease of handling during reassembly.

   a. Install new O-rings on inside and outside of packing gland and on outside of piston.
   b. To assemble piston rod assembly, install on the rod, in order: roll pin, washer, spring. washer, packing gland, sea!, piston assembly, spring, and roll pin.
   c. Insert piston rod assembly in cylinder and secure with snap ring.
   d. Install cylinder. (Refer to installation of brake cylinder.)
2. Cleveland cylinder number 10-30. (Refer to Figure 32-17.)
   a. Install new O-rings on inside and outside of packing gland on outside of piston.
   b. To assemble piston rod assembly, install on the rod, in order: roll pin, washer, spring, washer, packing gland with O-rings, seal, piston assembly with O-ring, spring, sleeve, and retaining ring.
   c. Insert piston rod assembly in cylinder and secure with retaining ring.
   d. Install cylinder. (Refer to installation of brake cylinder.)
3. Gar-Kenyon cylinder number 17000. (Refer to Figure 32-17.)
   a. Install new O-rings on inside and outside of fitting and on outside of piston.
   b. To assemble piston rod assembly, install on the rod, in order: roll pin, return spring retainer washer, return spring, fitting with O-rings, seal, piston with O-ring, spring and sleeve. Secure with retaining ring on the rod end.
   c. Insert piston rod assembly in cylinder and secure fitting.
   d. Install cylinder. (Refer to installation of brake cylinder.)

T. INSTALLATION OF BRAKE CYLINDER (Refer to Figure 32-16.)

1. Position cylinder at its mounting points and attach with clevis pins. Safety the pins with cotter pins.
2. Connect brake lines to cylinder fittings.
3. Bleed brakes.

U. BRAKE BLEEDING PROCEDURE (Gravity)

1. Attach a clean, clear plastic tube to right landing gear brake bleeder. Extend the free end of the tube to a container partially filled with hydraulic fluid (MIL-H-5606). Check the end of tube is submerged in fluid. Open bleeder 1 /2 to 1 turn.
2. Fill brake fluid reservoir, located on the firewall, with hydraulic fluid.
3. Check right hand toe brake pedal(s) in cockpit have been pulled full aft.
4. Pull hand brake handle and slowly pump master cylinder approximately 50 times or until hydraulic fluid is observed passing through plastic tube at brake bleeder.

—NOTE—

Fluid level in reservoir must be maintained to prevent air from entering system.

5. Pump right brake cylinder very slowly approximately 12 times. This will purge air from toe brake cylinder system. Watch for any air forced through clear plastic tube during this operation. Verify air has been forced from toe brake system.
6. Pump hand brake an additional 25 times or until no air is observed through clear plastic tube.
7. Tighten brake bleeder and remove plastic tube.
8. Repeat steps 1 through 6 for left main landing gear.

V. BRAKE BLEEDING PROCEDURE (Pressure)

1. Place a clean, clear plastic tube on vent fitting on top of brake fluid reservoir. Extend the free end of tube to a container partially filled with hydraulic fluid (MIL-H-5606). Verify tube end is submerged in fluid.
2. Attach another clear plastic tube to right landing gear brake bleeder. Connect the free end of tube to pressure source. Open bleeder 1 to 2 turns and pressure fill system with fluid.
3. With fluid continually flowing through system, SLOWLY and simultaneously actuate hand brake and toe brake pedal, of side being bled, several times to purge air from cylinders. On dual brake installations, actuate both pedals for brake being bled.

—NOTE—

By watching the fluid pass through the plastic hose fluid reservoir and the bleeder fitting on gear being bled, check if any air is left in system. If air bubbles are evident, filling of the system must continue until all air is out of the system and a steady flow of fluid is obtained If brake handle remains spongy, disconnect the bottom of toe brake cylinders (next to pedal) and rotate cylinder horizontally or above horizontal and use hand brake alone to purge air from system.

4. Close the open bleeder fitting to which the pressure hose is attached. Do not remove tube from fluid reservoir until both brakes have been bled. Check brakes on the side being bled for proper pedal pressure. Place cap on bleeder fitting.

—NOTE—

Remove any trapped air in the top of wheel brake unit by applying pressure to the system with the brake hand lever and slowly opening bleeder and releasing hand lever.

5. Repeat Steps 2 through 4 for left main landing gear.
6. Drain excess fluid from reservoir to fluid level with syringe.

W. BRAKE SYSTEM LEAK CHECK

Pull for a good, firm hand brake and lock parking brake mechanism. Allow system to stand for approximately 10 minutes. Grip park brake handle; it must not be able to be pulled aft further than the original set. If handle can be pulled toward the panel and feels spongy, a leak is in the system. A leak may appear at any one of the connections throughout system or internally in master brake cylinder or wheel brake assemblies.

X. BLEEDING OF THE BRAKES AFTER A UNIT HAS BEEN CHANGED

—CAUTION—

Do not allow pressure to bleed off before closing bleeders, as this will allow air in system. Repeat pumping and bleeding approximately 10 or more times or until all air is released from system. During all bleeding, fluid level of reservoir must be maintained.

1. Actuate hand brake handle until some pressure builds in system. Crack the attaching B nuts at any hose connection of replaced unit. Most of the spongy handle feeling will be displaced by this action.
2. Actuate master cylinder and toe brake cylinder of the side unit that was changed, and bleed fluid through brake assembly on the wheel by pumping pressure and cracking bleeder until pressure drops.

THIS SPACE INTENTIONALLY LEFT BLANK

GRIDS 2G6 AND 2G7
INTENTIONALLY LEFT BLANK

CHAPTER

33

LIGHTS

2G8

CHAPTER 33 - LIGHTS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
33-00-00	GENERAL	2G11	
33-00-00	Description and Operation	2G11	
33-00-00	Archer II	2G11	
33-00-00	Archer III (S/N's 2890206 and up)	2G11	
33-10-00	FLIGHT COMPARTMENT	2G13	
33-10-00	Instrument Panel Lights	2G13	
33-10-00	Archer II	2G13	
33-10-00	Archer III (S/N's 2890206 and up)	2G13	
33-10-00	Removal of Light Controls	2G13	
33-10-00	Removal of Archer II Dimmer Control Assembly	2G13	
33-10-00	Removal of Archer III Power Supply or Potentiometer Control (S/N's 2890206 and up)	2G13	
33-10-00	To Remove Power Supply	2G13	
33-10-00	To Remove Control Potentiometer	2G13	
33-10-00	Installation of Light Controls	2G14	
33-10-00	Installation of Archer II Dimmer Control Assembly	2G14	
33-10-00	Installation of Archer III Power Supply or Potentiometer Control (S/N's 2890206 and up)	2G14	
33-10-00	To Install Power Supply	2G14	
33-10-00	To Install Control Potentiometer	2G14	
33-10-00	Annunciator Panel	2G14	
33-10-00	Archer II Description and Operation	2G14	
33-10-00	Archer III Description and Operation (S/N's 2890206 and up)	2G15	
33-10-00	Troubleshooting Archer II Annunciator	2G16	
33-10-00	Troubleshooting Archer III Annunciator	2G17	
33-10-00	Replacement of Archer II Annunciator Panel Light Bulbs	2G21	
33-10-00	Replacement of Archer III Annunciator Panel Light Bulbs (S/N's 2890206 and up)	2G21	
33-10-00	Removal and Installation of Archer II and Archer III Vacuum Sensor Switch	2G22	
33-10-00	Removal and Installation of Archer II and Archer III Oil Pressure Sensor Switch (S/N's 2890206 and up)	2G22	

CHAPTER 33 - LIGHTS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
33-40-00	EXTERIOR	2H1	
33-40-00	Archer II - 14 Vdc System	2H1	
33-40-00	Description	2H1	
33-40-00	Removal and Installation of Landing Light	2H1	
33-40-00	Anti-Collision Beacon Light	2H1	
33-40-00	Removal	2H1	
33-40-00	Installation	2H1	
33-40-00	Anti-Collision Strobe Light	2H1	
33-40-00	Description	2H1	
33-40-00	Removal of Wing Tip Strobe Light	2H1	
33-40-00	Installation of Wing Tip Strobe Light	2H2	
33-40-00	Fin Tip Strobe Light	2H2	
33-40-00	Removal of Fin Tip Strobe Light	2H2	
33-40-00	Installation of Fin Tip Strobe Light	2H2	
33-40-00	Strobe Power Supply	2H2	
33-40-00	Removal of Strobe Power Supply	2H2	
33-40-00	Installation of Strobe Power Supply	2H3	
33-40-00	Troubleshooting Strobe Lights	2H4	
33-40-00	Archer III - 28 Vdc System	2H5	
33-40-00	Description	2H5	
33-40-00	Removal and Installation of Landing Light(s)	2H5	
33-40-00	Adjustment (Alignment) of Landing Light	2H6	
33-40-00	Navigation (Position) Lights	2H8	
33-40-00	Description	2H8	
33-40-00	Removing Bulb(s)	2H8	
33-40-00	Installing Bullb(s)	2H8	
33-40-00	Anti-Collision Strobe Light	2H8	
33-40-00	Description	2H8	
33-40-00	Removal of Wing Tip Strobe Light	2H8	
33-40-00	Installation of Wing Tip Strobe Light	2H9	
33-40-00	Strobe Power Supply	2H9	
33-40-00	Removal of Strobe Power Supply	2H9	
33-40-00	Installation of Strobe Power Supply	2H9	
33-40-00	Troubleshooting Strobe Lights	2H9	

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft..

This chapter gives instructions relating to maintenance of lighting equipment used on the aircraft.

A. DESCRIPTION AND OPERATION

1. Archer II

Electrical switches are on the center of the instrument panel just above the pedestal. Circuit breakers are on the lower right instrument panel. A rheostat switch on the left side of switch panel controls navigation lights and radio lights. A similar switch on the right side controls and dims panel lights.

The annunciator panel includes alternator, low oil pressure, and a low vacuum indicator light. Annunciator panel lights warn the pilot that a system may not be operating properly. The applicable system gauge must be checked and monitored to determine when or if action is required.

A rotating beacon is on the fin tip and anti-collision lights (strobe) are mounted in each wing tip.

2. Archer III (S/N's 2890206 and up)

Electrical switches are located in an overhead switch panel. The pitot heat and radio master switches, along with other avionics switches, are located in the center instrument panel just below the radio stack. Air conditioning and fan switches are located on the extreme lower right instrument panel. All switches are back lit rocker type.

Flight instruments are lit by post lights. All radios and navigation instruments are lit internally.

The switch lights, instrument post lights and radio lighting are controlled by individual electronic dimmer control assembly operated by HI-LOW adjument potentiometers. The dimmer control assemblies are mounted on the back of the right side of the firewall. The adjustment potentiometers are located on the lower left instrument panel below the pilot's control wheel.

The annunciator panel, located on the top right of the ***pilot's*** instrument panel, includes pitot heat off/inoperative, starter engaged, alternator inoperative, oil pressure, vacuum inoperative, low bus voltage and an optional air conditioning door open. A press-to-test switch is located to the right and a day-night toggle switch is located to the left of the annunciator panel.

A combined instrument panel flood/map light is located above the left and right pilot seats and are independently controlled by a potentiometer type control. Reading lights, each controlled by its own ON-OFF switch, are located above each rear seat. A courtesy light is installed above the main cabin entrance door. The courtesy light is wired directly to the battery so that it may be turned ON with the BATT MAST switch OFF.

In addition to navigation lights, exterior lighting includes white strobe type anti-collision lights installed in each wing tip. The Archer III also has two landing/taxi lights, one each installed into the leading edge of each wing tip. These lights are controlled by a switch located in the overhead switch panel.

THIS PAGE INTENTIONALLY LEFT BLANK

FLIGHT COMPARTMENT

A. INSTRUMENT PANEL LIGHTS

1. Archer II

Instrument panel lights are controlled by a 5 amp circuit breaker through a switch and transistorized dimmer control unit in the middle of the instrument panel just above the pedestal. There are two control knobs, one for panel lights and one for radio lights.

2. Archer III (S/N's 2890206 and up)

Instrument post lights, switch lights, and avionics lights are controlled by individual electronic dimmer control assemblies, located on the right side on the back of the firewall. They are operated by HI-LOW adjustment potentiometers located on the instrument panel below the pilot's control wheel,. The instrument post and switch lights power supplies are protected by a 7.5 amp PANEL/SWITCH LIGHTS circuit breaker. The avionics power supply is protected by a 5 amp RADIO LIGHTS circuit breaker

B. REMOVAL OF LIGHT CONTROLS

1. Removal of Archer II Dimmer Control Assembly

a Remove (from behind instrument panel) the electrical plug from dimmer control assembly.
b. Remove control knobs from the control units.
c. Remove machine screws holding dimmer control assembly to instrument panel and remove assembly .

2. Removal of Archer III Power Supply or Potentiometer Control (S/N's 2890206 and up)

a. To Remove Dimmer Control

(1) Place BATT MAST switch in OFF position and disengage (pull) BATTERY FEEDER circuit breaker
(2) Disengage (pull) PANEL/SWITCH LIGHTS or RADIO LIGHTS circuit breaker, as appropriate.
(3) Gain access to appropriate dimmer control, mounted on the rear of the firewall, from under the right side instrument panel.
(4) Disconnect electrical plug from dimmer control.
(5) Remove machine screws holding dimmer control to the firewall.
(6) Remove dimmer control.

b. To Remove Dimmer Control Potentiometer

(1) Place BATT MAST switch in OFF position and disengage (pull) BATTERY FEEDER circuit breaker
(2) Disengage (pull) PANEL/SWITCH LIGHTS or RADIO LIGHTS circuit breaker, as appropriate.
(3) Remove dimmer control potentiometer control knob by loosening set screw with appropriate size allen wrench.

(4) Remove nut securing dimmer control potentiometer to instrument panel. Potentiometer should now hang down below bottom of panel.
(5) Mark wires attached to back of dimmer control potentiometer for proper location. Unsolder wires from back of dimmer control.
(6) Remove dimmer control

C. INSTALLATION OF LIGHT CONTROLS

1. Installation of Archer II Dimmer Control Assembly

a. Position control assembly behind instrument panel and secure with two machine screws.
b. Install knobs and connect electrical plug on control unit.

2. Installation of Archer III Dimmer Control or Potentiometer Control (S/N's 2890206 and up)

a. To Install Dimmer Control

(1) Position dimmer control in proper location on back of firewall.
(2) Install machine screws holding dimmer control to the firewall.
(3) Connect electrical plug to power supply
(4) Engage (push in) PANEL/SWITCH LIGHTS or RADIO LIGHTS circuit breaker, as appropriate.
(5) Engage (push in) BATTERY FEEDER circuit breaker and place BATT MAST switch in ON position.
(6) Check that lights associated with replaced dimmer control operate properly.
(7) Place BATT MAST switch in OFF position.

b. To Install Control Potentiometer

(1). Solder wires to proper contacts on back of new dimmer potentiometer.

NOTE

Check that potentiometer control is turned fully counterclockwise.

(2). Position potentiometer in proper location and insert from back of instrument panel. Check that key lugs on switch align with key holes in back of panel.
(3) Install nut securing potentiometer to face of instrument panel.
(4) Install control knob. Check that knob pointer is in appropriate position. Tighten allen screw.
(5) Engage (push in) PANEL/SWITCH LIGHTS or RADIO LIGHTS circuit breaker, as appropriate.
(6) Engage (push in) BATTERY FEEDER circuit breaker and place BATT MAST switch in ON position.
(7) Check that lights associated with replaced potentiometer control operate properly.
(8) Place BATT MAST switch in OFF position.

D. ANNUNCIATOR PANEL

1. Archer II Description And Operation

The annunciator panel is a small cluster of lights which warn of malfunctions in circuits or systems. A malfunction is identified by a warning light. There are three amber warning lights and a push-button test switch. Power is supplied from the bus bar through a 5 amp fuse behind switch panel.

The VAC warning light is controlled by a vacuum sensor switch at the firewall and is attached to the vacuum regulator. The sensor switch will activate whenever differential pressure is below 3.5 in. hg.

The OIL warning light is controlled by an oil pressure sensor switch (incorporated in the oil line) at the firewall. The sensor switch will activate whenever the oil pressure is below 35 psi.

The ALT warning light is illuminated by current flowing from the bus bar to the alternator circuit. This condition exists when the alternator is not operating properly and its output is zero. During normal operation the alternator warning circuit is supplied with power from the top diode terminal. This current flows through a 5 amp fuse (near the diode heat sink) to the resistor and diode, creating a no-flow condition, which does not allow warning light illumination.

The test button is used to check operation of lights when engine is running. Lights will work when engine is not running if master switch is turned on.

2. Archer III Description And Operation (S/N's 2890206 and up)

While provisions are made for nine lights, the lighted cluster incorporates only six or, with the optional air conditioning system installed, seven lights . Refer to Chart 3301 for the description and function of each annunciator light.

CHART 3301. ARCHER III ANNUNCIATOR PANEL FUNCTION DESCRIPTION

Nomenclature	Color	Cause Of Illumination
LOW BUS VOLTAGE	RED	Illuminates when the electrical system drops from bus voltage (28 Vdc) to battery voltage (24.5 Vdc).
PITOT HEAT OFF/INOP	AMBER	Illuminates when the pitot heat fails or is selected OFF.
STARTER ENGAGED	AMBER	Illuminates when engine starter is engaged.
VACUUM INOP	AMBER	Illuminates when the vacuum sensor switch on the firewall is activated. The vacuum sensor switch is attached to a regulator, set to close when pressure falls below 3.5 inches of Hg.
ALTERNATOR INOP	RED	Illuminates when the alternator fails or is selected OFF.
OIL PRESSURE	AMBER	Illuminates when the in-line oil pressure sensor switch, located at the firewall, senses oil pressure has fallen below 35 psi.
BLACK LINE	GREEN	Blank.
BLACK LINE	GREEN	Blank.
AIR COND DOOR OPEN	AMBER	Used when optional air conditioner is installed. Illuminates when A/C control switch is ON , the door is extended to an open positon, and the fan switch is in an operating position, indicating proper air conditioning condenser door activation.

Power is supplied from the bus through a 5 amp circuit breaker and the annunciator box assembly. The DAY-NIGHT toggle switch, located to the left of the annunciator panel, is placed in the NIGHT position to dim the annunciator lights for night flight. This switch also activates the ammeter dimmer relay.

An annunciator PRESS-TO-TEST switch is located to the right of the annunciator panel. With the BATT MAST switch in the ON position, depressing this switch will illuminate all installed annunciator lights. Should any annunciator light(s) fail to illuminate, refer to Chart 3303, Toubleshooting Annunciator Panel.

3. Troubleshooting Archer II Annunciator Panel

—CAUTION—

Oil pressure sensor and vacuum sensor switches are similar in looks and size. Verify the correct unit is installed per parts cata - log part number and description.

Chart 3302 gives information on most commonly experienced problems on the Archer II. For further information contact a service representative at Vero Beach, Florida.

CHART 3302. TROUBLESHOOTING ARCHER II ANNUNCIATOR PANEL (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
All warning lights fail.	Blown fuse.	Replace 5 amp fuse behind instrument panel.
	No current from bus.	Check all wire segments, connections, and receptacle at the left side of annunciator panel.
All warning lights do not extinguish after engine is running.	Test switch grounded out.	Check terminals and replace switch if necessary.
OIL warning light fails.	Bulb burned out.	Replace.
	No current to sensor.	Check all wire segments and connections.
	Sensor activates at a too low setting.	Replace.
OIL warning light does not extinguish.	Sensor activates at a too high setting.	Replace.
	Sensor terminals bridged.	Remove material between terminals.
	Defective sensor.	Replace.

CHART 3302. TROUBLESHOOTING ARCHER II ANNUNCIATOR PANEL (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
VAC warning light fails.	Bulb burned out.	Replace.
	No current to sensor.	Check all wire segments and connections.
	Sensor activates at a too low setting.	Replace.
	Defective sensor.	Replace.
VAC warning light does not extinguish.	Sensor activates at a too high setting.	Replace.
	Sensor terminals bridged.	Remove material between terminals.
	Defective sensor.	Replace.
ALT warning light fails.	Bulb burned out.	Replace.
	No current from bus to resistor.	Check all wire segments and connections
ALT warning light does not extinguish.	Blown fuse.	Replace 5 amp fuse near diode heat sink.
	No current from fuse to resistor	Check all wire segments and connections
Test switch fails to activate warning lights.	Bad switch or connections.	Check wires and replace switch if necessary.

4. Troubleshooting Archer III Annunciator Panel

—CAUTION—

Oil pressure sensor and vacuum sensor switches are similar in looks and size. Verify the correct unit is installed per parts cata - log part number and description.

Chart 3303 gives information on most commonly experienced problems on the Archer III. For further information contact a service representative at Vero Beach, Florida.

CHART 3303. TROUBLESHOOTING ARCHER III ANNUNCIATOR PANEL (SHEET 1 OF 3)

TROUBLE	CAUSE	REMEDY
All warning lights fail to illuminate.	5 amp ANNUNCIATOR PANEL circuit breaker open. No current from bus.	Reset (push IN) circuit breaker Check all wire segments, connections, and receptacle at the left side of annunciator panel.
Test switch fail to activate warning lights.	Bad switch or connections.	Check wires and replace switch if necessary.
All warning lights do not extinguish after engine is running.	Test switch shorted or bad connections.	Check wire connections and replace switch if necessary.
Lights fail to dim when DAY-NIGHT switch placed in NIGHT position.	Defective K-3 relay in annunciator box assembly. Open wires from day/night switch to dimmer box.	Replace relay. Check wire connections.
LOW BUS VOLTAGE fails to illuminate.	Blown bulb(s). Blown in line fuse between bus bar and Low Voltage Monitor. Defective low voltage monitor in ammeter dimming control assembly.	Replace bulb(s) Replace fuse. Replace low voltage monitor.
LOW BUS VOLTAGE fails to dim with switch in NIGHT position	Open wire between between bus bar and low voltage monitor; between low voltage monitor and annunciator box assembly; between annunciator box assembly and annunciator light Defective K-3 relay.	Locate and repair open wire. Repalce relay.
PITOT HEAT OFF/INOP fails to illuminate.	Blown bulb(s). If pitot heat switch is OFF, faulty switch. Faulty pitot sensor assembly.	Replace bulb(s). Replace switch. Replace sensor assembly.

CHART 3303. TROUBLESHOOTING ARCHER III ANNUNCIATOR PANEL (SHEET 2 OF 3)

TROUBLE	CAUSE	REMEDY
PITOT HEAT OFF/INOP fails to dim with switch in NIGHT position	Open R-4 resistor in annunciator box assembly.	Replace resistor.
	Defective K-2 relay in annunciator box assembly.	Replace relay.
STARTER ENGAGE fails to illuminate	Blown bulb(s).	Replace bulb(s).
	Blown 5 amp in line fuse between starter contactor and annunciator panel.	Replace fuse.
STARTER ENGAGE fails to dim with switch in NIGHT position	Open R-8 resistor in annunciator box assembly.	Replace resistor.
	Defective K-4 relay in annunciator box assembly.	Replace relay.
VACUUM INOP fails to illuminate.	Blown bulb(s).	Replace bulb(s).
	No voltage to sensor.	Check all wire segments and connections.
	Sensor activates at a too low setting.	Replace.
	Defective sensor.	Replace.
VACUUM INOP light does not extinguish.	Sensor activates at a too high setting.	Replace.
	Sensor terminals bridged.	Remove material between terminals.
	Defective sensor.	Replace.
VACUUM INOP fails to dim with switch in NIGHT position.	Open R-6 resistor in annunciator box assembly.	Replace resistor.
	Defective K-3 relay in annunciator box assembly.	Replace relay.

CHART 3303. TROUBLESHOOTING ARCHER III ANNUNCIATOR PANEL (SHEET 3 OF 3)

TROUBLE	CAUSE	REMEDY
ALTERNATOR INOP fails to illuminate.	Blown bulb(s).	Replace bulb(s).
ALTERNATOR INOP fails to extinguish.	Blown 1/4 amp fuse between alternator and alternator out switch	Replace fuse.
	Defective ALTERNATOR OUT switch.	Replace switch
	Open wiring or connector between ALTERNATOR OUT switch an annunciator panel.	Check wires W2A and W2B, and connectors R2-6 and P2-6 for open or bad connection. Repair as necessary.
ALTERNATOR INOP fails to dim with switch in NIGHT position.	Open R-10 resistor in annunciator box assembly.	Replace resistor.
	Defective K-5 relay in annunciator box assembly.	Replace relay.
OIL PRESSURE fails to illuminate.	Blown bulb(s).	Replace bulb(s).
	No current to sensor.	Check all wire segments and connections.
	Sensor activates at a too low setting.	Replace sensor.
OIL PRESSURE fails to extinguish	Sensor activates at a too high setting.	Replace.
	Sensor terminals bridged.	Remove material between terminals.
	Defective sensor.	Replace.
OIL PRESSURE fails to dim with switch in NIGHT position.	Open R-5 resistor in annunciator box assembly.	Replace resistor.
	Defective K-3 relay in annunciator box assembly.	Replace relay.

5. Replacement Of Archer II Annunciator Panel Light Bulbs

Light bulb replacement does not require removal of annunciator panel. The lenses are designed to be a friction fit. The bulbs fit into the back side of the lens. To replace a defective bulb, pull the corresponding lens out of annunciator panel. Withdraw defective bulb from lens and replace with a new bulb. Align the key on the lens with the keyway in the annunciator panel socket and press lens into place.

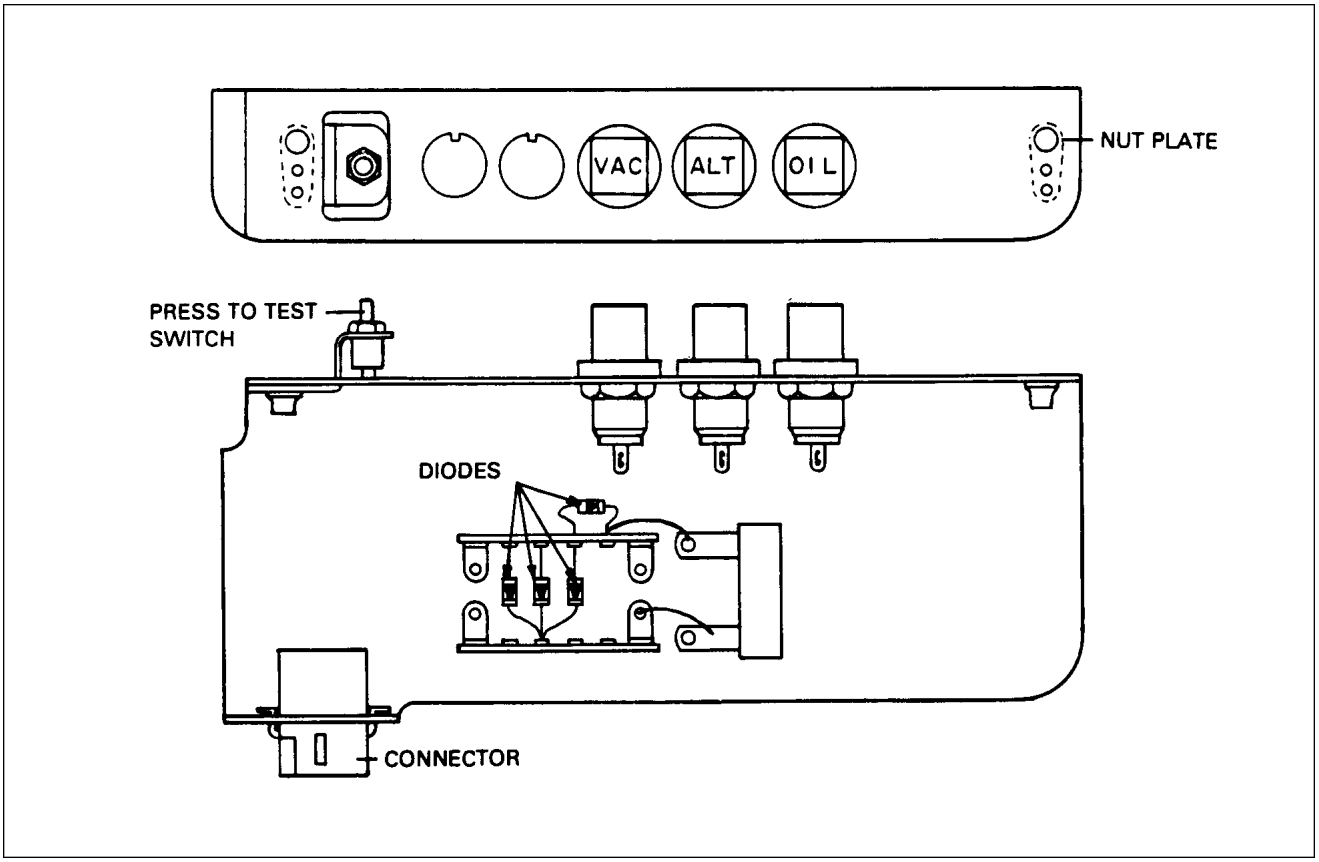


Figure 33-1. Archer II Annunciator Panel

6. Replacement Of Archer III Annunciator Panel Light Bulbs (S/N's 2890206 and up)

It is not necessary to remove the annunciator panel assembly to replace lamp bulbs. Simply "PUSH-IN" on the function light until it "clicks", and release pressure. The cover assembly will be partially ejected from the lamp base assembly. Pull the cover from the base and rotate to expose the lamp bulbs. Replace defective bulb(s) and reverse removal procedure. Select BATT MAST switch ON; then depress "Test" switch to verify lamp is functioning.

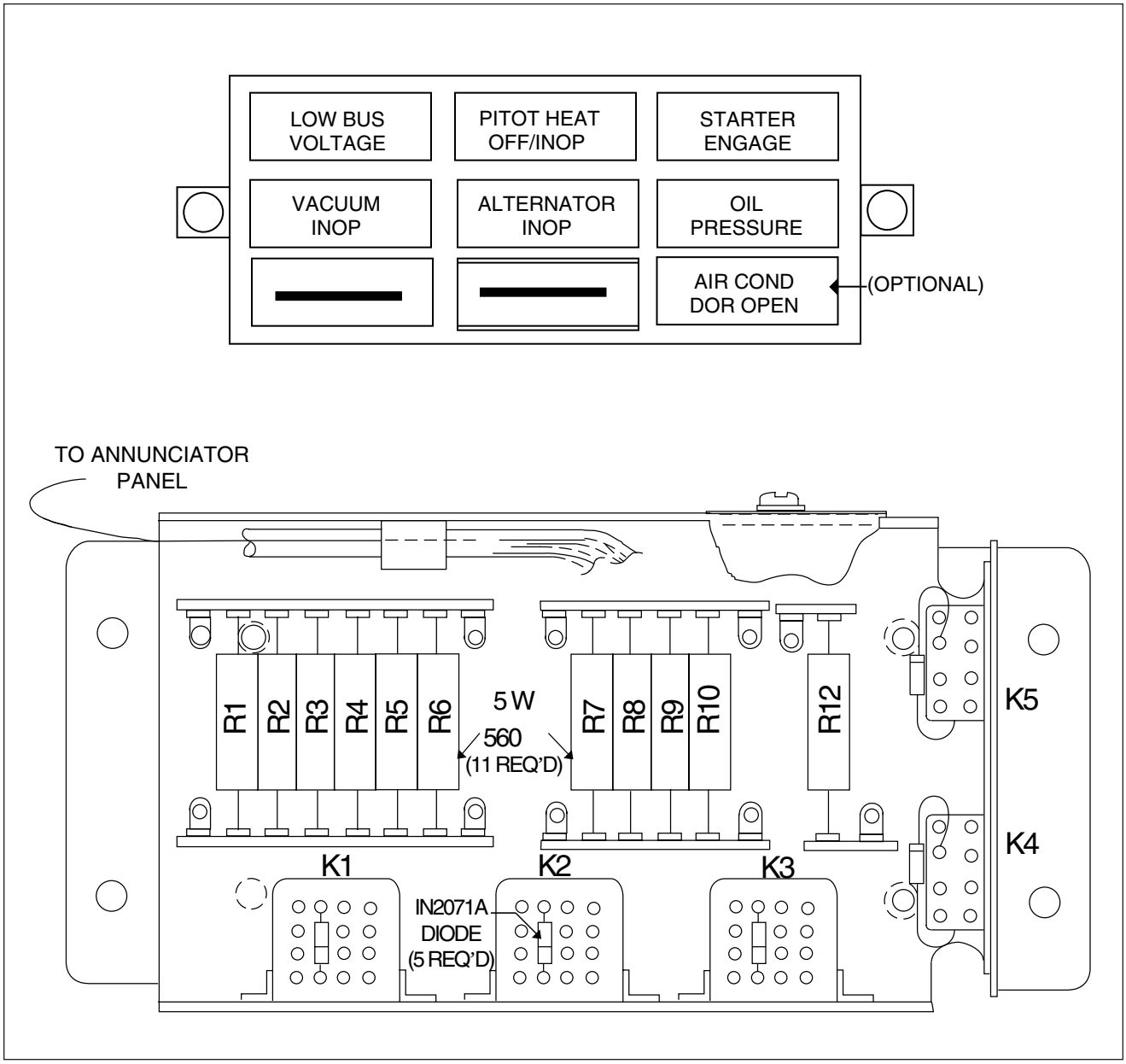


Figure 33-2 Archer III Annunciator Panel and Box Assembly

7. Removal And Installation Of Archer II and Archer III Vacuum Sensor Switch

Refer to chapter 37.

8. Removal And Installation Of Archer II and Archer III Oil Pressure Sensor Switch

Refer to chapter 79

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

EXTERIOR

A. ARCHER II - 14 VDC SYSTEM

1. Description

The landing and taxi light is one light bulb. It is a 100 watt unit within nose cowl section. The light is controlled by a switch to a 10 amp circuit breaker. The three navigation lights are controlled by a single switch and a 10 amp circuit breaker. Optional anti-collision strobe lights may be mounted on each wing tip in the same assembly with navigation lights. These units are rated to flash approximately 50 times per minute.

2. Removal and Installation of Landing Light

a. Remove the screw securing the clamp to the bottom of lamp.
b. Pull lamp out and remove the two electrical leads.

—NOTE—

Take note of the wire placement on the lamp to aid installation.

c. To install lamp, connect electrical leads and insert lamp into position. Position clamp at bottom and secure with appropriate screw.

3. Anti-Collision Beacon Light

a. Removal

(1) Loosen screw securing clamp around rotating beacon lens. Remove clamp and lens.
(2) Remove light bulb from bayonet socket.

— NOTE —

To remove complete rotating beacon assembly, remove screws holding it to fin tip. Pull rotating beacon assembly out and disconnect electrical leads. Note their placement to aid instal - lation. Remove rotating beacon assembly.

b. Installation

(1) Install light bulb in bayonet socket.
(2) Replace lens and clamp, and secure by tightening screw on clamps.

4. Anti-Collision Strobe Light

a. Description

Strobe lights are on each wing tip in the same assembly with navigation lights. They are rated to flash approximately 50 times a minute.

b. Removal Of Wing Tip Strobe Light

(1) Remove screw securing navigation light cover and remove cover.
(2) Remove three screws securing navigation light bracket assembly and pull out.

(3) Remove strobe lamp by cutting wires on lamp under mounting bracket.
(4) Remove defective lamp.
(5) Remove and discard plug with the cut wires from its electrical socket.

c Installation Of Wing Tip Strobe Light

(1) Route wires from new lamp down through the hole in navigation light bracket.
(2) Insert wire terminals in the plastic plug supplied with new lamp. Wire according to schematic diagram. Connect plug to receptacle. (Refer to chapter 91.)
(3) Position strobe lamp on navigation light bracket.
(4) Secure navigation light assembly and bracket with appropriate screws.
(5) Install navigation light cover and secure with appropriate screw.

5. Fin Tip Strobe Light

a. Removal Of Fin Tip Strobe Light

(1) Remove clamp securing lens to mounting plate on fin tip.
(2) Remove lens from strobe light assembly.
(3) Remove screws securing fin tip to fin.
(4) Lift fin tip and disconnect electrical plug.
(5) Pull strobe light assembly out of fin tip, electrical plug will pull up through hole in middle of mounting plate.

b. Installation Of Fin Tip Strobe Light

(1) Insert new electrical plug down through hole in mounting plate and position strobe light assembly in place.
(2) Position lens in place.
(3) Secure lens to mounting plate with previously removed clamp.
(4) Connect electrical plugs underneath fin tip.
(5) Replace fin tip and secure with appropriate screws.

6. Strobe Power Supply

a. Removal Of Strobe Power Supply

— NOTE —

Note the placement of leads to aid installation.

The strobe power supply is in the aft section of fuselage.
(1) Remove access panel to aft section of fuselage in the rear baggage compartment to access power supply.
(2) To remove power supply disconnect electrical plugs. (One to four plugs depending on installation. Note the placement of plugs to aid installation.)
(3) Disconnect the other electrical leads.
(4) Remove four screws holding power supply to fuselage. Remove power supply.

b. Installation Of Strobe Power Supply (Refer to Figure 33-3)

(1) Position power supply in place and secure with the four previously removed screws.
(2) Connect electrical leads in proper place.
(3) Connect electrical plugs in proper place.
(4) Replace access panel in rear baggage compartment.

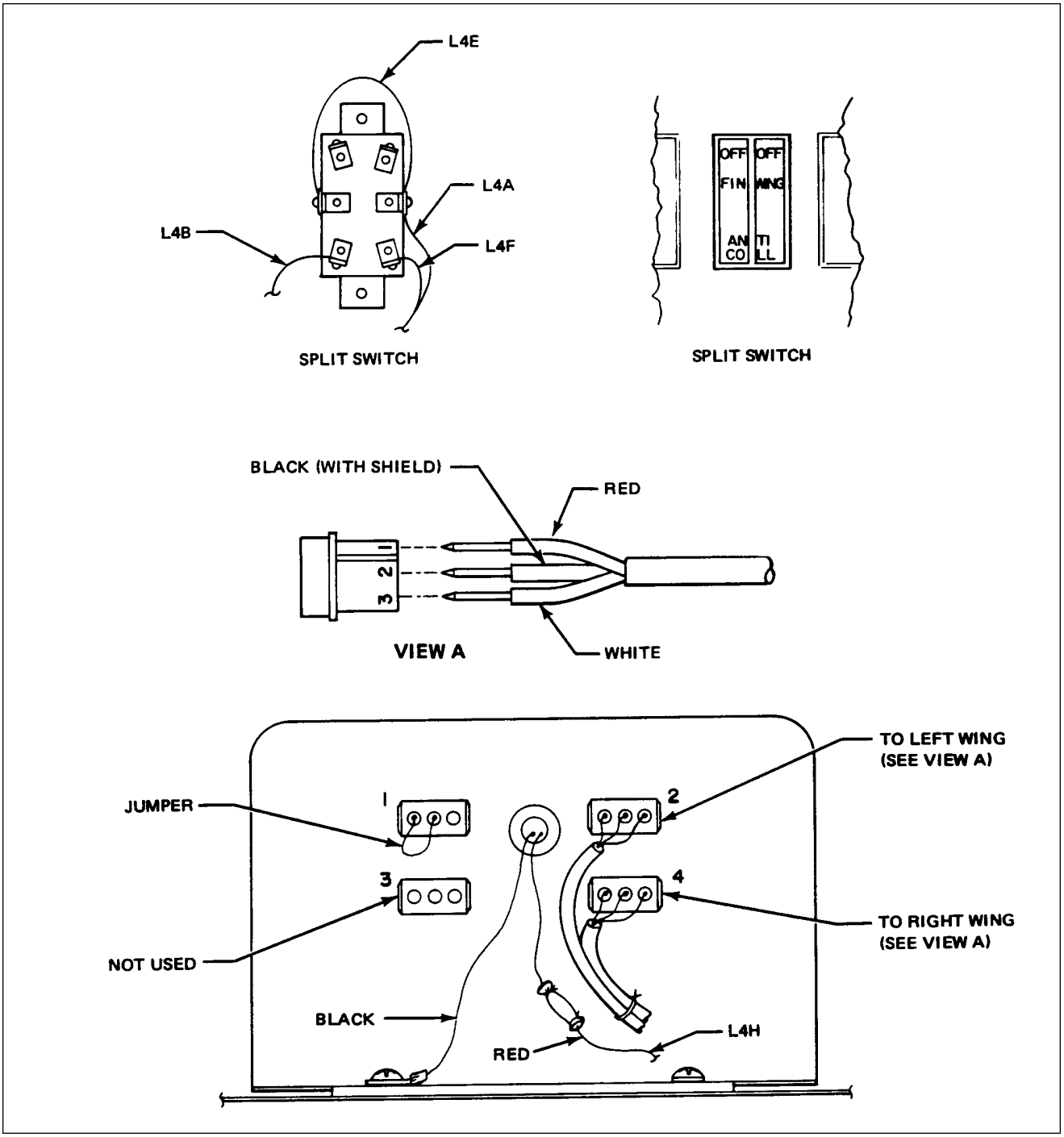


Figure 33-3. Archer II Strobe Light Connections

7. Troubleshooting Strobe Lights

The strobe light functions as a condenser discharge system. A condenser in the power supply is charged approximately 450-Volts dc then discharged across Xenon flash tube at intervals approximately 50 flashes per minute. Condenser is parallel across Xenon flash tube to hold off the 450-volts dc until flash tube is triggered by an external pulse. This pulse is generated by a solid state timing circuit in the power supply.

When troubleshooting the strobe light system, check if the trouble is in flash tube or power supply. Flash tube replacement will verify if tube is defective. Normal operating power supply emits an audible tone of 1 to 1.5 kHz. If no sound is emitted, check system as follows: (When troubleshooting the system, use the appropriate schematic. Refer to chapter 91.)

— CAUTION —

When disconnecting power supply, allow five minutes of bleed down time before handling unit.

a. Check input voltage at power supply is 14-volts.

— CAUTION —

When disconnecting and connecting power supply input con - nections, do not reverse connections. Reversed polarity of input voltage for just an instant will permanently damage power supply. Reversed polarity destroys a protective diode in the power supply, causing self-destruction from overheated power supply. The damage is sometimes not immediately apparent, but will cause system failure in time.

b. Check for malfunction in interconnecting cables.
   (1) Check Pins 1 and 3 of interconnecting cable are not reversed.
   (2) Use an ohmmeter to check continuity between Pin 1 and 3 of interconnecting cable. If a reading is obtained, cable is shorted and must be replaced.

— CAUTION —

A short of the type in steps a. and b. will not cause permanent damage to power supply, but the system will be inoperative. Any connection between Pins 1 and 3 of the interconnecting cable discharge the condenser in the power supply and destroy trigger circuits.

c. Check interconnecting cables for shorts.
   (1) Disconnect output cables from power supply outlets.
   (2) Use an ohmmeter for the following continuity checks.
      (a) Check from Pin 1 to Pin 1, Pin 2 to Pin 2, and Pin 3 to Pin 3. If no continuity exists, cable is broken and must be replaced.
      (b) Check continuity between Pins 1and 2, 1 and 3, and 2 and 3 of the interconnecting cable. lf continuity exists cable is shorted and must be replaced.

d. Check tube socket assembly for shorts.
   (1) Disconnect tube socket assembly of the anti-collision light from the interconnecting cable.
   (2) Use an ohmmeter for the following continuity checks.
      (a) Check continuity between Pin 1 of AMP connector to Pin 1 of tube socket. lf no continuity exists, tube socket assembly is broken and must be replaced.
      (b) Check Pin 2 of AMP connector to Pins 6 and 7 of tube socket.
      (c) Check Pin 3 of AMP connector to Pin 4 of tube socket.
         1 When making these tests, if no continuity exists, tube socket assembly is broken and must be replaced.

B. ARCHER III - 28 VDC SYSTEM

1. Description

The Archer III has two landing lights; one installed in each wing tip. These lights are also used for taxi operations. Both lights are controlled by a two position rocker switch (LDG LIGHT - OFF) located in the overhead switch panel. The circuit is protected by a 10 amp LANDING LIGHT circuit breaker located on the main circuit breaker panel.

Individual red and white navigation lights are installed in the left wing tip. The right wing tip contains individual green and white navigation lights. The lights are controlled by a rocker type switch (NAV LIGHT) located in the overhead switch panel. The circuit is protected by a 5 amp NAV LIGHTS circuit breaker.

A white strobe anti-collision light is installed in each wing tip in the same assembly with navigation lights. These units are rated to flash approximately 50 times per minute. The anti-collision are controlled by an independent rocker switch (STROBE LIGHT) in the overhead switch panel, through a power supply unit located in the aft section of the fuselage. The circuit is protected by a 5 amp ANTI-COLL LIGHTS circuit breaker.

2. Removal and Installation of Landing Light(s).

a. Remove the appropriate Plexiglas lens.

— NOTE —

Use care not to disturb adjustment bolts when removing landing light bulb(s). Should adjustment bolt settings be disturbed, check light alignment after installing new bulb.

b. Remove the three ***lamp retaining bolts.*** Remove retaining ring. (Refer to Figure 33-4.)
c. Pull lamp forward far enough to gain access to the electrical connection tabs on back of the lamp.
d. Remove the two brass screws connecting the electrical leads to the lamp.
e. Remove and discard defective bulb.
f. Connect electrical leads to replacement bulb using two brass screws.
g. Position lamp in place and install retainer ring.
h. Install the three lamp retaining bolts.
i. Check lamp function by turning BATT MAST switch ON and selecting LND LIGHT switch ON.
j. Place BATT MAST and landing light switch in OFF position
k. Install Plexiglas lens.

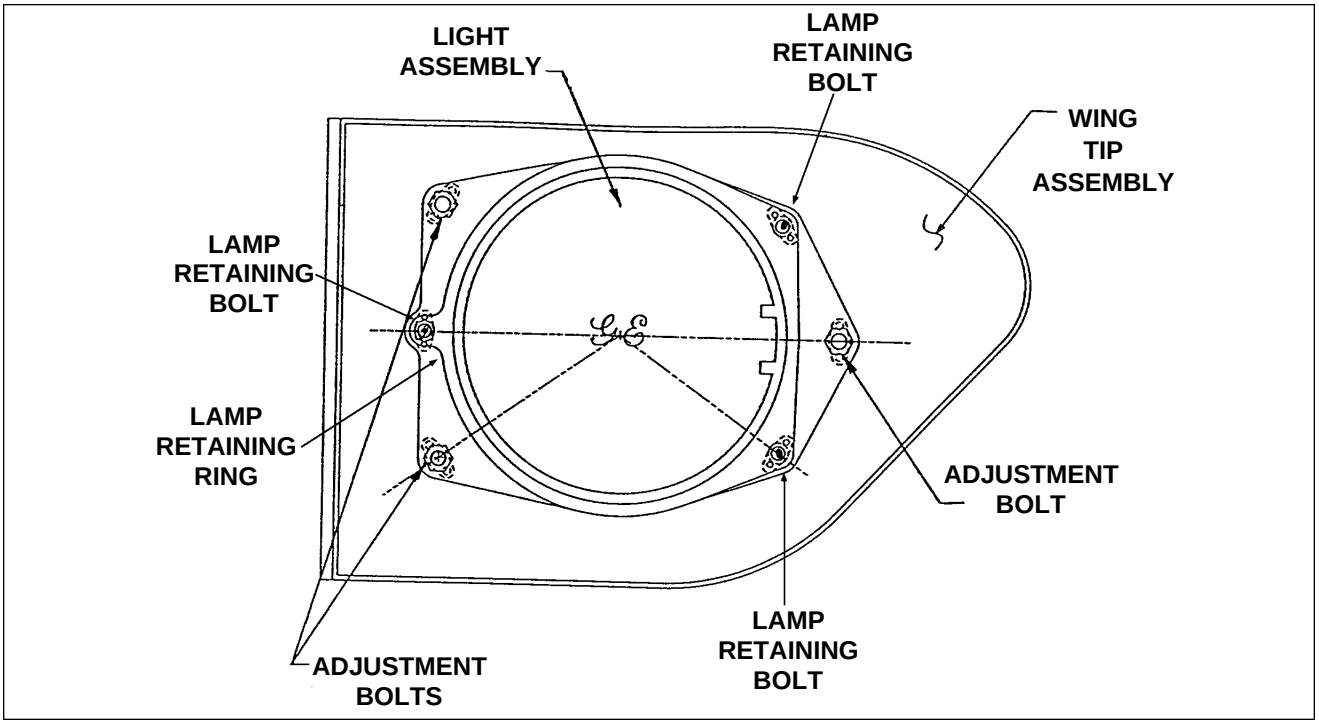


Figure 33-4. Archer III Landing Light Installation

3. Adjustment (Alignment) of Landing Light

a. Locate airplane 20 feet from a target wall as shown in figure 33-5.
b. Level airplane both vertically and horizontally. (Refer to Chapter 8)
c. Remove the appropriate Plexiglas cover lens.
d. Connect airplane to a 28 Vdc external power supply.
e. Position the BATT MAST and LDG LIGHT switches ON.
f. Adjust the three landing light adjustment bolts as necessary to move the landing light housing so that the center of the light beam illuminates the target wall at the following locations. (Refer to Figure 33-4.):

(1) The left landing beam is centered at a point 32 ± 1 ***inches*** up from the floor.

(2) The left landing beam is centered at a point 15 ***feet*** ± 3 ***inches*** outboard from the airplane's centerline.

(3) The right landing beam is centered at a point 32 ± 1 ***inches*** inches up from the floor.

(4) The right landing beam is centered at a point 15 ***feet*** ± 3 ***inches*** outboard from the airplane's centerline.

g. Position the BATT MAST and LDG LIGHT switches ON.
h. Disconnect 28 Vdc external power supply.
i. Install Plexiglas cover lens.
j. Remove devices used to level airplanes. (Refer to Chapter 8)

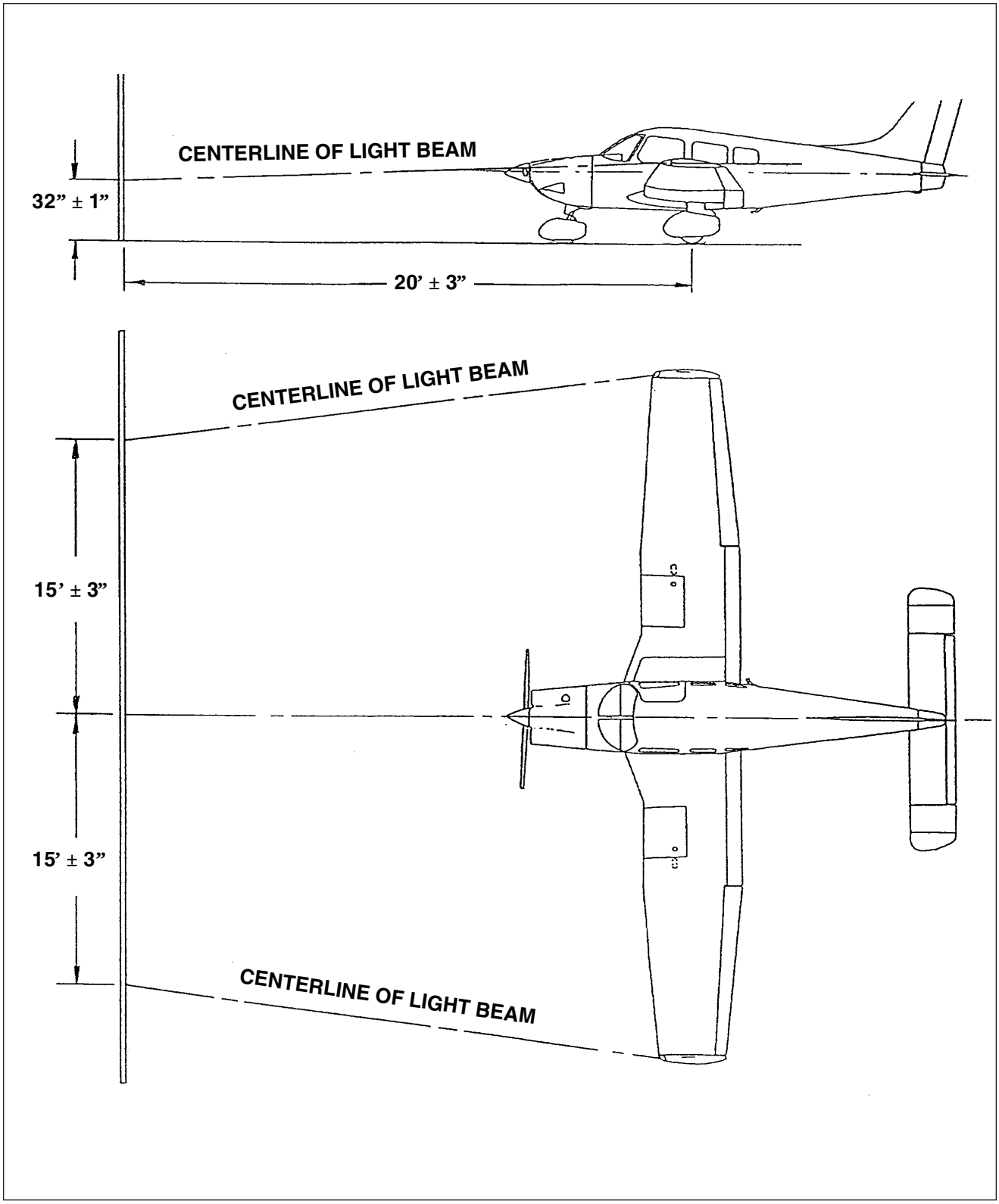


Figure 33-5. Archer III Landing Light Adjustment

3. Navigation (Position) Lights

a. Description

Navigation (position) lights are on each wing tip in the same assembly as the strobe anti-collision light.

b. Removing bulb(s)

(1) Ensure that the BATT MAST and NAV LIGHT switches are in OFF position.
(2) Disengage (pull out) NAV LIGHTS circuit breaker.
(3) Remove the two screws securing the lens cover plate.
(4) Carefully remove cover plate. The red (left wing) or green (right wing) lens, along with the white and anti-collision light lenses, may be removed with the cover plate.
(5) To remove the left or right navigation light bulb (bulbs behind the green or red lenses), twist bulb counterclockwise to release bulb and pull out.
(6) To remove the white (aft) navigation light, pull straight out on bulb.

b. Installing bulb(s)

(1) To install left or right navigation light bulb (the bulbs behind the green or red lenses):
  (a) Align bulb in socket.
  (b) Push in on bulb, while twisting clockwise, until bulb is seated in position.
(2) To install the white (aft) navigation light, align bulb with socket and push straight in until bulb is seated.
(3) Set (push in) NAV LIGHTS circuit breaker.
(4) Verify that bulb(s) is/are working by selecting BATT MAST and NAV LIGHT switches ON and checking that all ***navigation*** light bulbs are lit. Select BATT MAST and NAV LIGHT switches OFF.
(5) Locate lenses over appropriate bulbs and position cover plate over lenses and light fixture. Be sure that the red lens (right wing) or green lens (left wing) is located over the forward bulb
(6) Install cover plate over lenses and secure with the two screws removed in step a, (1).

4. Strobe Anti-Collision Light

a. Description

Strobe anti-collision lights are on each wing tip in the same assembly with navigation lights. They are rated to flash approximately 50 times a minute.

b. Removal Of Wing Tip Strobe Light

(1) Ensure that the BATT MAST and STROBE LIGHT switches are in OFF position.
(2) Disengage (pull out) ANTI-COLL LIGHTS circuit breaker.
(3) Remove two screws securing navigation light cover and remove cover.
(4) Remove three screws securing navigation light bracket assembly
(5) Separate light bracket assembly from wing tip by pulling out on bracket assembly.
(6) Cut Ty-Wrap securing connector together. Pull connector apart.
(7) Remove wire protection grommet from light bracket.
(8) Remove defective lamp from light bracket.

c Installation Of Wing Tip Strobe Light

(1) Route wires from new lamp through the hole in navigation light bracket.
(2) Install wire protection grommet onto light bracket.
(3) Connect plug to receptacle. Insure like color wires on plug and receptacle are aligned or opposite each other. Secure plug and receptacle connection with a Ty-Wrap.
(4) Position strobe and navigation light assembly in place on wing tip.
(5) Secure navigation light assembly and bracket to wing tip with the three screws removed during disassembly.
(6) Set (push in) ANTI-COLL LIGHTS circuit breaker.
(7) Verify that bulb(s) is/are working by selecting BATT MAST and STROB LIGHT switches ON and checking that both ***strobe*** lights flash. Select BATT MAST and STROB LIGHT switches OFF.
(8) Install navigation light cover. Check that red or green lens, as appropriate, are properly located. Secure cover with the two screws removed during disassembly.

5. Strobe Power Supply (Refer to Figure 33-6)

— NOTE —

Note the placement of leads to aid installation.

The strobe power supply is in the aft section of fuselage.

a. Removal of Power Supply.

(1) Ensure that the BATT MAST and STROBE LIGHT switches are in OFF position.
(2) Disengage (pull out) ANTI-COLL LIGHTS circuit breaker.
(3) Remove access panel to aft section of fuselage in the rear baggage compartment to gain access to the power supply.
(4) Disconnect electrical plugs (three each). Note the placement of plugs to aid installation.
(5) Note and mark location; then disconnect the other electrical leads.
(6) Remove four screws holding power supply to fuselage. Remove power supply.

b. Installation Of Strobe Power Supply (Refer to Figure 33-6)

(1) Position power supply in place and secure with the four screws previously removed.
(2) Connect electrical leads in proper place.
(3) Connect electrical plugs in proper place.
(4) Set (push in) ANTI-COLL LIGHTS circuit breaker.
(5) Verify lights are working by selecting BATT MAST and STROB LIGHT switches ON and checking that both ***strobe*** lights flash. Select BATT MAST and STROB LIGHT switches OFF.
(6) Replace access panel in rear baggage compartment.

6. Troubleshooting Strobe Lights

When troubleshooting the strobe light system, check if the trouble is in flash tube or power supply. Flash tube replacement will verify if tube is defective. Normal operating power supply emits an audible tone of 1 to 1.5 kHz. If no sound is emitted, check system as follows: (When troubleshooting the system, use the appropriate schematic. Refer to chapter 91.)

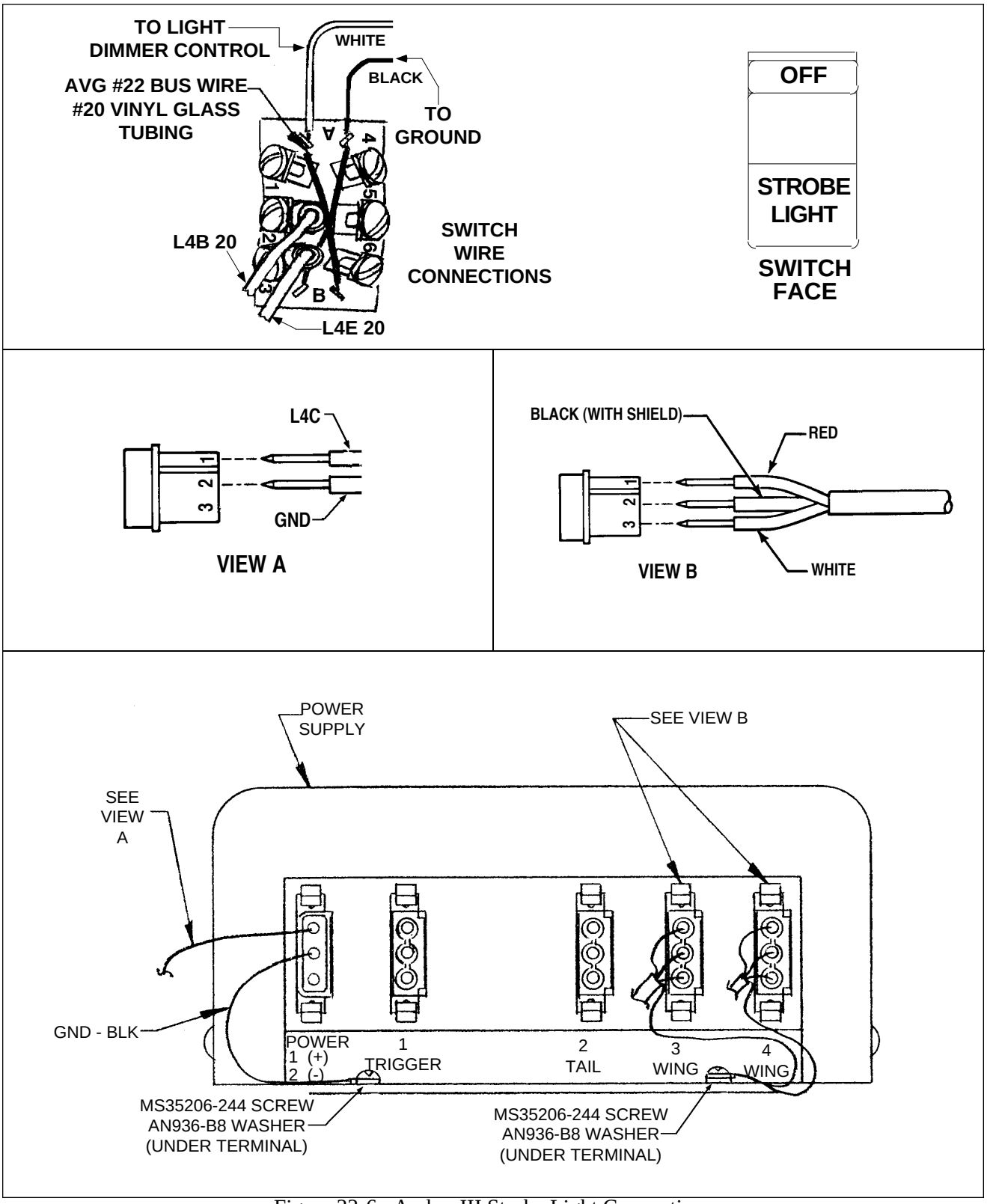


Figure 33-6. Archer III Strobe Light Connections

— CAUTION —

When disconnecting power supply, allow five minutes of bleed down time before handling unit.

a. Check input voltage at power supply is 28-volts.

— CAUTION —

When disconnecting and connecting power supply input con - nections, do not reverse connections. Reversed polarity of input voltage for just an instant will permanently damage power supply. Reversed polarity destroys a protective diode in the power supply, causing self-destruction from overheated power supply. The damage is sometimes not immediately apparent, but will cause system failure in time.

b. Check for malfunction in interconnecting cables.
   (1) Check Pins 1 and 3 of interconnecting cable are not reversed.
   (2) Use an ohmmeter to check continuity between Pin 1 and 3 of interconnecting cable. If a reading is obtained, cable is shorted and must be replaced.

— CAUTION —

A short of the type in steps a. and b. will not cause permanent damage to power supply, but the system will be inoperative. Any connection between Pins 1 and 3 of the interconnecting cable discharge the condenser in the power supply and destroy trigger circuits.

c. Check interconnecting cables for shorts.
   (1) Disconnect output cables from power supply outlets.
   (2) Use an ohmmeter for the following continuity checks.
      (a) Check from Pin 1 to Pin 1, Pin 2 to Pin 2, and Pin 3 to Pin 3. If no continuity exists, cable is broken and must be replaced.
      (b) Check continuity between Pins 1and 2, 1 and 3, and 2 and 3 of the interconnecting cable. lf continuity exists cable is shorted and must be replaced.

d. Check tube socket assembly for shorts.
   (1) Disconnect tube socket assembly of the anti-collision light from the interconnecting cable.
   (2) Use an ohmmeter for the following continuity checks.
      (a) Check continuity between Pin 1 of AMP connector to Pin 1 of tube socket. lf no continuity exists, tube socket assembly is broken and must be replaced.
      (b) Check Pin 2 of AMP connector to Pins 6 and 7 of tube socket.
      (c) Check Pin 3 of AMP connector to Pin 4 of tube socket.
         1 When making these tests, if no continuity exists, tube socket assembly is broken and must be replaced.

GRIDS 2H12 AND 2H13
INTENTIONALLY LEFT BLANK

CHAPTER

34

NAVIGATION AND PITOT/STATIC

2H14

CHAPTER 34 - NAVIGATION AND PITOT STATIC

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
34-00-00	NAVIGATION AND PITOT STATIC	2H17	
34-00-00	General	2H17	
34-00-00	Description and Operation	2H17	
34-00-00	Removal and Replacement of Face Mounted Instruments	2H17	
34-00-00	Gyro Fitting Installation aprocedure	2H18	
34-10-00	FLIGHT ENVIRONMENTAL DATA/PITOT STATIC	2H21	
34-10-00	Description and Operation	2H21	
34-10-00	Vertical Sped Indicator	2H21	
34-10-00	Sensitive Altimeter	2H22	
34-10-00	Airspeed Indicator	2H23	
34-10-00	Outside Air Temperature Gauge	2H24	
34-10-00	Removing and Installing Outside Temperature Gauge	2H24	
34-10-00	Archer II windshiels Mounted Instrument	2H24	
34-10-00	Archer III Side Panel Mounted Instrument	2I1	
34-20-00	ATTITUDE AND DIRECTION	2I3	
34-20-00	Gyro Instruments	2I3	
34-20-00	General	2I3	
34-20-00	Maintenance of Gyro Instruments - General	2I3	
34-20-00	Gyro Fitting Installation Procedure (Sigma Tek, formally Edo Aire)	2I3	
34-20-00	Air Driven Attitude Devation Indicator (ADI)	2I3	
34-20-00	Troubleshooting	2I4	
34-20-00	Electrically Driven Attitude Devation Indicator (ADI)	2I5	
34-20-00	General	2I5	
34-20-00	Operational Limitations	2I5	
34-20-00	Troubleshooting	2I6	
34-20-00	Heading Indicators (Directional Gyros)	2I6	
34-20-00	Air Driven Heading Indicators	2I6	
34-20-00	Electrically Driven Heading Indicator (Directional Gyro)	2I6	

CHAPTER 34 - NAVIGATION AND PITOT STATIC

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
34-20-00	Heading Indicators (Directional Gyros) (Cont)	—	
34-20-00	Troubleshooting	2I7	
34-20-00	General	2I7	
34-20-00	Air Driven Gyros	2I7	
34-20-00	Magnetic Compass	2I8	
34-20-00	General	2I8	
	Troubleshooting	2I8	
34-20-00	Adjustment of Magnetic Compass	2I9	
34-20-00	Turn Indicator	2I10	
34-20-00	General	2I10	
34-20-00	Troubleshooting	27I10	

NAVIGATION AND PITOT STATIC

A. GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

1. Description and Operation

The flight environment data and pitot static instruments consists of:

a. Pitot and static air sources, which supplies both pitot and static pressure for the airspeed indicator, and static pressure for the altimeter, and vertical speed indicator. (Refer to Figure 34-1.) These instruments are face mounted. Pitot heat, offered as an option on the Archer II, is standard on the Archer III.

b. The vacuum system (optional on Archer II models, standard on Archer III models) consists of an engine driven vacuum pump that supplies supplies negative air pressure to operate the:
   (1) Attitude Deviation Indicator (ADI) (Attitude Gyro).
   (2) Gyroscopic Heading Indicator or Horizontal Situation Indicator (HSI).

   An electrically operated auxiliary vacuum pump is also provided as a backup in the event the engine driven pump fails.

c. An electrically operated turn and slip (Turn and Bank) Indicator.

d. A magnetic compass.

Both the ADI and HSI require 4.8 to 5.2 psi ***negative*** pressure for proper rotor speed. An annunciator (VAC on the Archer II; VACUUM INOP on the Archer III) will illuminate should the negative pressure decreases to 4.0 psi . The annunciator will extinguish when the electric auxiliary vacuum pump is turned on and the negative pressure increases to more than 4.0 psi.

2. Removal and Replacement of Face Mounted Instruments

Since all instruments are mounted in a similar manner in Archer II and Archer III, a description of a typical removal and installation is provided as a guide for removal and installation of instruments in those model airplanes. Special care should be taken when any operation pertaining to instruments is performed.

a. Remove face panel by removing screws from around perimeter of panel.

b. With face panel removed, mounting screws for individual instruments will be exposed. Remove connections to instrument prior to removing mounting screws of instrument to be removed.

– NOTE –

Tag instrument connections for ease of installation.

c. Installation of instruments will be completed by reversing instructions. After installation is completed and before replacing instrument face panel, check all components for security and clearance of control column.

Instruments installed in Archer III airplanes are back mounted on a solid metal instrument panel. These instruments must be removed from the back of the panel.

3. Gyro Fitting Installation Procedure

Use of teflon tape on fitting threads is recommended and should be installed as follows:

– CAUTION –

Permit no oil, grease, pipe compound or any foreign material to enter ports prior to installation of fittings. Make sure that all air lines are clean and free of foreign particles and/or residue before connecting lines to gyro. DO NOT USE THREAD LUBE ON FITTINGS OR IN PORTS. Use of thread lube can cause contamination shortening life of gyro and can cause premature failure. Any evidence of the use of thread lube will create a WARRANTY VOID CONDITION.

a. Carefully lay teflon tape on fitting threads allowing one thread to be visible from end of fitting. Hold place and wrap in direction of threads so tape will remain tight when fitting is installed.
b. Apply sufficient tension while winding to assure that tape forms into thread grooves (one full wrap plus 1/2 inch overlap is sufficient).
c. After wrap is complete, maintain tension and tear tape by pulling in direction of wrap. Resulting ragged end is key to tape staying in place.
d. Press tape well into threads.
e. Screw fitting into port, being careful not to exceed torque requirements as noted on decal located on cover of gyro. (Refer to Chart 9105 for specifications and manufacturer's address.)

THIS SPACE INTENTIONALLY LEFT BLANK

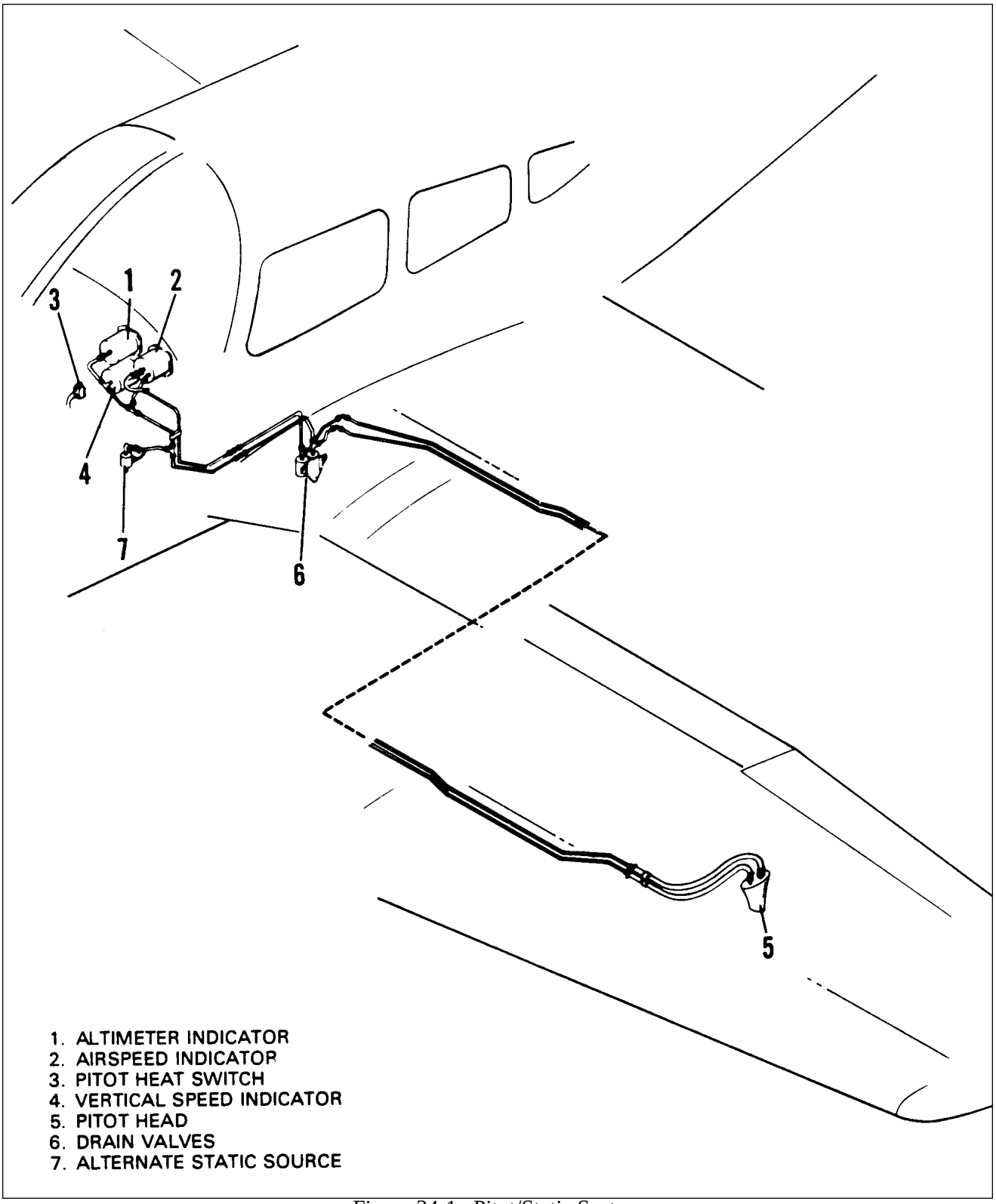


Figure 34-1. Pitot/Static System

THIS PAGE INTENTIONALLY LEFT BLANK

FLIGHT ENVIRONMENTAL DATA / PITOT STATIC

DESCRIPTION AND OPERATION (Refer to Figure 34-1)

The pitot air system consists of a pitot mast on the underside of the left wing with its related plumbing. Impact air pressure entering the pitot is transmitted from the pitot inlet through hose and tubing routed through the wing to airspeed indicator on the instrument panel. A partially or completely blocked pitot head will give erratic or zero instrument reading.

The static air system consists of interconnecte static ports on the underside and aft side of the (pitot) static mast. The ports are connected to airspeed indicator, altimeter, and vertical speed indicator by hose and tubing routed through the wing. An alternate static air source is below instrument panel in front of pitot. The alternate static source is part of the standard system and has a shutoff valve to close the port when not needed. Pitot and static lines are drained through separate drain valves on left lower side of fuselage interior.

A. VERTICAL SPEED INDICATOR

The vertical speed indicator measures ***rate*** of change in static pressure when the airplane is climbing or descending. A pointer and dial will show the airplane's ***rate*** of climb or descent in feet per minute. Due to instrument lag, the airplane will be climbing or descending before the instrument starts to indicate. The instrument will continue to indicate a climb or descent after the airplane is level. Thus, the instrument is unreliable in rough air. This lag is not considered a malfunction.

NOTE—

If any connections in static system are opened for checking, system must be rechecked per F.A.R. 23.1325.

CHART 3401. TROUBLESHOOTING VERTICAL SPEED INDICATOR (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
Pointer does not set on zero when airplane is in accelerated level flight.	Aging of diaphragm.	Use set screw to reset pointer on zero. Tap instrument ***gently*** while resetting.
Pointer fails to respond.	Obstruction in static line. Static vents frozen over. Water in static line. Obstruction in pitot head.	Disconnect all instruments connected to static line.Clear line. Check individual instrument for obstruction in lines. Clean lines and head.
Pointer oscillates.	Leaks in static lines. Defective mechanism.	Disconnect all instruments connected to static line. Check individual instruments for leaks. Connect instruments to static line and test installation for leaks. Replace instrument.

CHART 3401. TROUBLESHOOTING VERTICAL SPEED INDICATOR (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
Rate of climb reads when airplane is banked.	Water in static line.	Disconnect static lines and blow out lines from cockpit out to pitot head.
Pointer has to be set before each flight.	Temperature compensator inoperative	Replace instrument
Pointer cannot be reset to zero	Diaphragm distorted.	Replace instrument.
Instrument reads very low during climb or descent.	Instrument case broken or leaking.	Replace instrument.

B. SENSITIVE ALTIMETER

The altimeter indicates pressure altitude in feet above sea level. The indicator has three pointers and a dial scale; the long pointer is read in hundreds of feet, the middle pointer in thousands of feet, and the short pointer in ten thousands of feet. A barometric pressure window is on the right side of indicator dial and is set by a knob on lower left corner of instrument. The altimeter is a ***sealed*** diaphragm connected to the pointers through mechanical linkage. The diaphragm mounting is made of bi-metallic temperature sensitive strips that compensates for variations from standard temperatures. The instrument ***case*** is vented to static air system and, as static air pressure decreases, the diaphragm expands, causing the pointers to move through mechanical linkage.

CHART 3402. TROUBLESHOOTING ALTIMETER (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
Excessive scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation	Defective mechanism.	Replace instrument.
High or low reading.	Improper venting.	Eliminate leak in static pressure system. Check alignment of pitot/static mast.
Setting knob hard to turn.	Wrong lubrication or lack of lubrication.	Replace instrument.
Inner reference marker will not move when setting knob is turned.	Out of engagement.	Replace instrument.
Setting knob set screw loose or missing.	Not tightened when altimeter was reset.	Tighten instrument screw if loose. Replace instrument, if screw is missing.
Cracked or loose cover glass.	Case gasket hardened.	Replace instrument.

CHART 3402. TROUBLESHOOTING ALTIMETER (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
Dull or discolored markings.	Age.	If condition is undesirable, replace instrument.
Barometric scale and reference markers out of synchronism.	Slippage of mating parts.	Replace instrument.
Barometric scale and reference markers out of synchronism with pointers.	Drift in mechanism.	Refer to latest revision of 43:13.
Altimeter sticks at altitude or does not change with altitude change.	Water or restriction in static line.	Remove static lines from all instruments, blow line clear from cockpit to pitot/static mast.
Altimeter changes reading as airplane is banked.	Water in static line.	Remove static lines from all instruments, and blow line clear from cockpit to pitot/static mast.
Altimeter requires frequent setting.	Temperature compensator inoperative.	Change instrument.

—NOTE—

If any connections in static system are opened for checking, system must be rechecked per F.A.R. 23.1325.

C. AIRSPEED INDICATOR

The airspeed indicator reads the speed of the airplane passing through the air. Airspeed indication is the differential pressure reading between pitot air to pressure and static air pressure. The instrument has the diaphragm vented to the pitot air source. The case is vented to static air system. As airplane increases speed, pitot air pressure increases, causing diaphragm to expand. A mechanical linkage moves the pointer to show speed . The instrument dial is calibrated in knots and miles per hour, and has operating range markings for safe operation of the airplane.

CHART 3403. TROUBLESHOOTING PITOT/STATIC TUBES AND AIRSPEED INDICATOR (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
Pointers of all instruments using static pressure do not read properly	Leak in instrument case or in static lines.	Check for leak(s) and seal

CHART 3403. TROUBLESHOOTING PITOT/STATIC TUBES AND AIRSPEED INDICATOR
(SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
Pointer of instrument oscillates	Defective mechanism.	Replace instrument.
Instrument reads high.	Pointer not on zero.	Replace instrument
	Leaking static system.	Find leak and correct.
Instrument reads low.	Pointer not on zero. Leaking static system. Pitot head incorrectly aligned.	Replace instrument. Find leak and correct. Align pitot head.
Airspeed changes as airplane is banked.	Water in static line.	Remove static lines from all instruments, and blow line clear from cockpit to pitot/static mast.

—NOTE—

If any connections in static system are opened for checking, system must be rechecked per F.A.R. 23.1325.

D. OUTSIDE AIR TEMPERATURE GAUGE (OAT)

Unlit OAT's are mounted in the pilot's windshild on the Archer II. The Archer III has an internally lit OAT installed in the side panel just forward of the pilot's storm window. The gauge must be removed to replace the bulb.

1. Removing and Installing Outside Temperature Gauge

– CAUTION –

During installation of all OAT's, only finger tighten gauge and external threaded hex tube (sunshield). Over torquing will damage instrument.

a. Archer II windshield mounted instrument.

(1) Remove external sunshield by turning it counterclockwise. ***Turn by hand only***.
(2) Remove bushing on outside of windshield by sliding it off of threaded shaft. Note position of any washers or spacers.
(3) Remove gauge and inner bushing by pulling gauge through windsield from inside the airplane.
(4) Install new gauge in reverse sequence. Check that tapered face on inner and outer bushings are positioned properly against windshield. Check gauge position before ***hand tightening*** sunshield

b. Archer III side panel mounted instrument.

(1) Remove pilot's window close out panel.
(2) Disconnect power wire.
(3) Remove external sunshield by turning it counterclockwise. ***Turn by hand only***.
(4) Unscrew instrument from support bushing. Note position of any washers or spacers.
(5) Install new gauge in reverse sequence. Check gauge position before ***hand tightening*** sunshield
(6) Install pilot's window close out panel.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

ATTITUDE AND DIRECTION

A. GYRO INSTRUMENTS

1. General

On the Archer II, air and electric attitude gyros are used, per the option package installed. Both are displacement type gyros with free rotors mounted in gimbal assemblies. Consult the A.F.C.S. manufacturer's service manual if a flight director, or autopilot is coupled to the attitude horizon.

On Archer III models, only air driven attitude gyros are used.

2. Maintenance of Gyro Instruments - General

Do not attempt to repair any faulty gyro instrument in the field. Faulty instruments should be forwarded to a certified instrument repair shop for repairs.

3. Gyro Fitting Installation Procedure (Sigma Tek, formally Edo-Aire)

The use of teflon tape on the tapered pipe threads is recommended and should be installed as follows:

— CAUTION —

PERMIT NO OIL, GREASE, PIPE COMPOUND OR ANY FOREIGN MATERIAL TO ENTER PARTS PRIOR TO INSTALLATION OF FITTINGS. MAKE SURE THAT ALL AIR LINES ARE CLEAN AND FREE OF FOREIGN PARTICLES AND/OR RESIDUE BEFORE CONNECTING LINES TO GYRO. DO NOT USE THREAD LUBE ON FITTINGS OR IN PORTS. THE USE OF THREAD LUBE CAN CAUSE CONTAMINATION SHORTENING THE LIFE OF THE GYRO AND CAN CAUSE PREMATURE FAILURE. ANY EVIDENCE OF THE USE OF THREAD LUBE WILL CREATE A WARRANTY VOID CONDITION.

a. Carefully lay teflon tape on the fitting threads allowing one thread to be visible from the end of the fitting. Hold in place and wrap in the direction of the threads so tape will remain tight when the fitting is installed.
b. Apply sufficient tension while winding to assure that tape forms into thread grooves (one full wrap plus 1/2 inch overlap is sufficient).
c. After wrap is complete, maintain tension and tear tape by pulling in direction of wrap. The resulting ragged end is the key to the tape staying in place.
d. Press tape well into threads.
e. Screw fitting into port being careful not to exceed torque requirements as noted on decal located on cover of gyro. (Refer to Chapter 91, List of Consumable Materials.)

B. AIR DRIVEN ATTITUDE DEVATION INDICATORS (ADI)

—CAUTION—

The gyro air filter must be clean or replaced before adjusting gyro air pressure.

The ADI is essentially an air driven gyroscope rotating in a horizontal plane and is operated by the same principle as the directional gyro. The gyro is driven primarily by the engine driven dry pneumatic vacuum pump. An electrically operated vacuum pump is also installed as a backup in the event of primary pump failure. Air volume, not air pressure, spins the gyro rotor. A pressure regulator will automatically adjust air pressure within proper limits. If the air filter becomes contaminated, restricting air flow, gyro rotor speed will be reduced.

Air flow directed at gyro buckets, causes the rotor to spin approximately 17,000 to 22,000 rpm, allowing gyroscopic ability to remain rigid in space. The instrument case moves freely about the spinning gyro rotor in three dimensions due to a gimbal assembly. A bar across the face of the indicator represents the horizon and aligning the miniature airplane to the horizon bar simulates the alignment of the airplane to the actual horizon. Any deviation simulates the deviation of the airplane from the true horizon. The ADI is marked for different degrees of bank. The display is stable and shows minute attitude changes of 1 degree. Unlike the directional gyro, the erection mechanism activity is seen by a rapidly wobbling and leveling pitch bar, when power is first applied. The instrument can be adjusted for parallax by a knob on the lower center instrument face. Except on the Sigma Tech ADI used on the Archer III, a second knob, when held to the IN position, engages forks which cages the gyro rotor in the erect position.

When the optional King Flight Director System is installed on the Archer III, the pilot and (if installed) copilot's ADI's are King KI-256 Flight Director Attitude Indicator(s) that combine air driven gyro(s) with electrical pitch and roll inputs and outputs to the autopilot/flight director.

1. Troubleshooting

CHART 3404. TROUBLESHOOTING ATTITUDE DEVIATION INDICATOR (SHEET 1 of 2)

Trouble	Cause	Remedy
Bar fails to respond.	Observe vacuum gauge for insufficient vacuum.	If insufficient vacuum exist, check pump and tubing.
	Filter dirty.	Clean or replace filter.
	Defective instrument.	Replace gyro instrument.
Bar does not settle.	Insufficient vacuum.	Check line and pump. Adjust valve.
	Incorrect instrument.	Check part number.
	Defective instrument.	Replace.
Bar oscillates or shimmies continuously.	Instrument loose in panel.	Tighten mounting screws.
	Vacuum too high.	Adjust vacuum regulators.
	Defective mechanism.	Replace instrument.

CHART 3404. TROUBLESHOOTING ATTITUDE DEVIATION INDICATOR (SHEET 2 of 2)

Trouble	Cause	Remedy
Instrument does not indicate level flight.	Instrument not level in panel.	Loosen screws and level instrument.
	Aircraft out of trim.	Trim aircraft.
Bar high after 180° turn.	Normal, if it does not exceed 1/16 inch.	
Instrument tumbles in flight.	Observe vacuum gauge for low vacuum.	If vacuum is low, reset regulator.
	Dirty filter.	Clean or replace filter.
	Line to filter restricted.	Replace line.
	Plug missing or loose in instrument.	Replace or tighten plug.

C. ELECTRICALLY DRIVEN ATTITUDE DEVIATION INDICATORS

1. General

Some of the option packages offered on the early Archer II's included an electrically operated attitude indicator. These gyros have electrically driven rotors; the gyro rotor acts as the armature of an induction motor. Brush assemblies are not used because their friction would result in abnormal precession (the rotor armature is inductively excited). The electric attitude deviation indicator is subject to the same operational requirements as air driven attitude deviation indicator, except for the method of obtaining rotor rotation and the erection mechanism design. There are no electrically operated heading indicators offered on the Archer III.

2. Operational Limitations

The attitude deviation indicator has no attitude limits. If pitch reaches 90 degrees, polar effect is reached and the horizon bar display will rotate 180 degrees to an inverted position and will rotate 180 degrees when the airplane is again right side up. The attitude deviation indicator will not be damaged by such extreme attitude changes and will correct itself in a short time. There are no roll limitations to the attitude deviation indicator. When the gyro rotor is at rest, and power is applied, the erection mechanism exerts maximum authority and rapid and noticeable erection results. If power is removed from the spinning rotor (engine shut down while briefly discharging passengers), the gyro rotor continues to rotate at high speed, but the erection mechanism is not functional. When power is again applied to electrically driven attitude deviation indicator, the erection mechanism begins to function. However, due to gyro rigidity because of the high rotor speed, erection is considerably longer than normal. The electric attitude deviation indicator exhibits small errors in pitch and roll after roll out from a coordinated turn and small pitch changes after acceleration or deceleration. The erecting mechanism quickly returns the gyro to its proper position. The electric attitude deviation indicator is more efficient and less subject to error than the air driven attitude deviation indicator

3. Troubleshooting

Service is restricted to instrument installation and power source. Obvious malfunctions, such as failure to erect or large horizon bar displacement that cannot be corrected by manually caging the instrument, require repair or replacement of instrument. . Typical installation examples of attitude deviation indicator malfunctions are due to: deteriorating electrical grounds or sagging instrument panel shock mounts. Replace or repair the instrument only after the system has proven to be good.

D. HEADING INDICATORS (DIRECTIONAL GYROS)

1. Air Drive Heading Indicators

Air driven heading indicators are standard equipment on the Archer II and III, and are offered as an option for installation on the copilot's instrument panel.

The gyro stabilized heading indicator is a flight instrument incorporating an air driven gyro stabilized in the vertical plane. The gyro is rotated at high speed by lowering the pressure in the airtight case and simultaneously allowing atmospheric air pressure to enter the instrument against the gyro buckets. Due to gyroscopic inertia, the spin axis tends to continue pointing in the same direction, even though the aircraft yaws, turns, pitches or rolls. This relative motion between the gyro and the instrument case is shown on the instrument dial which, in earlier models, is similar to the compass card. On later models, and on all heading indicators used on the Archer III, the compass card has a 360° face.

Unless slaved to the Earth's magnetic field, the gyroscopic heading indicator has no sense of direction and must be set to the magnetic compass. This is also true of normally slaved heading indicator when it becomes necessary to deslave it. Once deslaved, it acts as free spinning gyroscope. The card, when set to agree with the airplane's magnetic compass, provides a positive heading indication free from acceleration/deceleration and turning errors. However, prececession forces applied to the gyro during turns may cause the gyro to "drift" and, upon completion of the turn, result in a difference in readings between the directional gyro and the magnetic compass, necessitating resetting the gyro. Even while maintaining a given heading, the gyro compass tends to precess (drift) due to internal friction, spin axis error, air turbulence and airflow. Therefore, the gyro should be checked against the magnetic compass, and reset as necessary, at least every 15 minutes. Maximum acceptable precession is 5° in 0:15 minutes.

Some heading indicators are limited to 55° of roll and pitch. Should these limits be exceeded, the gyro will "tumble". This is evidenced by a rapid spinning of the compass card. The gyro in a properly operating instrument can be erected, after returning to straight and level flight, by caging the gyro and resetting it.

2. Electrically Driven Heading Indicator (Directional Gyro)

Some of the option packages offered on the early Archer II's included an electrically operated heading indicator. These indicators have electrically driven rotors, with the gyro rotor acting as the armature of an electric motor. To eliminate the friction of brush assemblies (causing abnormal precession) the rotor/armature is inductively excited. The electric directional gyro is subject to the same operational requirements as air driven directional gyro, except for the method of obtaining rotor rotation and erection mechanism design. There are no electrically operated heading indicators offered on the Archer III.

3. Troubleshooting

a. General

Service is restricted to instrument installation and power source. Obvious malfunctions , such as failure to erect or compass card spinning that cannot be corrected by manually caging the instrument, require repair or replacement. Typical installation examples of heading indicator malfunctions are due to: restricted air flow from air line kinks or leaks, contaminated air filters, deteriorating electrical grounds, sagging instrument panel shock mounts, systems regulators, faulty vacuum/pressure gauges. (Air pressure must be 5.5 plus or minus 0.5 psig). Replace or repair the instrument only after the operating system has proven to be good.

b. Air Driven Gyros

CHART 3405. TROUBLESHOOTING HEADING (DIRECTIONAL GYRO) INDICATOR

Trouble	Cause	Remedy
Excess precession (drift) in either direction.	Setting error.	Review paragraph titled AIR DRIVEN HEADING INDICATOR above.
	Defective instrument.	Replace instrument.
	High or low vacuum. If vacuum is not correct, check for the following: a. Relief valve improperly adjusted. b. Incorrect gauge reading. c. Pump failure. d. Vacuum line kinked or leaking.	 a. Adjust. b. Replace gauge. c. Repair or replace. d. Check and repair. Check for collapsed inner wall of hose.
Dial spins during turn.	Gimbal limits of (55° bank or pitch) exceeded.	Recage gyro in level flight.
Dial spins continuously.	Defective mechanism.	Replace.

THIS SPACE INTENTIONALLY LEFT BLANK

D. MAGNETIC COMPASS

1. General

The magnetic compass is a self-contained instrument. The compass card is mounted on two magnets, which tend to align themselves with the Earth's magnetic field, permitting the compass to use Earth's magnetic north as a reference. Due to magnetic attractions created by nearby metal surfaces and the airplanes's electrical equipment, the compass magnets are frequently "pulled" away from magnetic north. Much of this error (not all) can be removed by a procedure called swinging the compass (see Adjustment of Magnetic Compass). This involves placing the airplane on a magnetic compass rose, and, using a brass screwdriver to adjust compensators incorporated in the instrument, removing as much of the error as possible while on headings of north, south, east and west. The remaining error is then noted on a compass correction (deviation) card for each 30° of heading. The completed correction card is then placed in receptacle mounted on the instrument. The compass should be swung whenever instruments or radios are changed and at least once a year. For night operations, the instrument is internally lit. The light is powered by the airplanes's instrument lighting circuit.

2. Troubleshooting

CHART 3406. TROUBLESHOOTING MAGNETIC COMPASS (SHEET 1 OF 2)

Trouble	Cause	Remedy
Excessive card error.	Compass not properly compensated.	Compensate instrument.
	External magnetic interference.	Locate magnetic interference and eliminate if possible.
Excessive card oscillation.	Insufficient liquid.	Replace instrument.
Card sluggish.	Weak card magnet.	Replace instrument.
	Excessive pivot friction or broken jewel.	Replace instrument.
	Excessive pivot friction or broken jewel.	Replace instrument.
Liquid leakage.	Loose bezel screws.	Replace instrument.
	Broken cover glass.	Replace instrument.
	Defective sealing gaskets.	Replace instrument.
Discolored markings.	Age.	Replace instrument.

CHART 3406. TROUBLESHOOTING MAGNETIC COMPASS (SHEET 1 OF 2)

Trouble	Cause	Remedy
Defective light.	Burned out lamp or broken circuit.	Check lamp or continuity of wiring.
Card sticks.	Altitude compensating diaphragm collapsed.	Replace instrument.
Card does not move compensating screws are turned.	The gears that turn compensating magnets are stripped.	Replace instrument.
Compass swings erratically when radio transmitter is keyed.	Normal.	

3. Adjustment of Magnetic Compass

Before attempting to compensate compass place the aircraft in simulated flight conditions. Check to see that the doors are closed, flaps in retracted position, engine running, throttle set at 1000 rpm or low idle, and aircraft in level flight attitude. Aircraft master switch, alternator switch and all radio switches should be in the ON position. All other cockpit controlled electrical switches should be in the OFF position. Use a brass or other non-magnetic screwdriver to make adjustments to compensator screws.

(a) Place airplane on a magnetic compass rose designed and intended for adjusting magnetic compasses.

(b) Set adjustment screws of compensator on zero. Zero position of adjusting screws is when the dot of the screw is lined up with the dot of the frame.

(c) Align airplane with magnetic North heading on the compass rose. Adjust N-S adjustment screw until compass reads exactly North.

(d) Align airplane with magnetic East heading on the compass rose. Adjust E-W adjusting screw until compass reads exactly East.

(e) Align airplane with magnetic South heading and note error. Adjust N-S adjusting screw until one-half of the error has been removed.

6. Align airplane with magnetic West heading and note error. Adjust E-W adjusting screw until one-half of the error has been removed.
7. Align airplane with magnetic north. Note heading being indicated on magnetic compass (may not be North) and enter on compass deviation (correction) card.
8. Align airplane with successive magnetic 30° headings, i. e., 030°, 060°, 090°, 120°, etc. Enter actual compass reading on each heading on compass deviation (correction) card.
9. If deviations (difference between actual magnetic heading and what compass indicates on that particular heading) exceeds ± 10° on any heading:
   a. Check to be sure no magnetic metals are near compass (tools, flashlights, pocket knives, wristwatches etc.)
   b. Check to be sure screwdriver being used to make adjustments is either fiber or non-magnetic metal, such as brass.

10. When satisfied that errors in excess of 10° is fault of the instrument, replace instrument.
11. After installing new instrument, repeat steps 1 through 8.

E. TURN INDICATOR

1. General

Archer II and Archer III airplanes are equipped with turn coordinator(s). The convential turn and slip indicator(s) are available as an option on both models. The gyro in either one is electrically operated. The turn portion of both indicators is a gyroscope, while a ball sealed in a curved glass tube filled with dampening fluid is used to maintain coordinated flight. Both types work on the precession principle.

The gyro in the turn coordinator is installed so that the indicator, mechanically linked to the gyro, responds to both the ***rate*** of yaw or turn, and ***rate*** (not degree) of roll. With this indicator, if the aircraft is rolled right and left rapidly, the indicator will move while the airplane is ***rolling,*** indicating the ***rate*** (degrees per second) of roll. If the aircraft is then held in at a constant bank angle, and rudder is applied to maintain heading (such as when "slipping"), the indicator will come back to zero rate, indicating no roll or turn. Should the airplane be permitted to turn once a desired bank angle is established, the indicator will remain deflected in the direction of the roll/turn, now indicating ***rate*** of turn. Thus, using the flight controls to keep the indicator on the appropriate turn index, will result in the airplane becoming established in a coordinated, standard rate (3° per second) turn.

The gyro in the turn and slip indicator, which is the older style, is installed so that the needle responds only to ***rate*** of yaw or ***rate*** turn. It has a vertical needle in the center of the dial mechanically linked to the gyro. Unless the aircraft is turning or yawing, the needle will not move regardless of roll ***rate***. The greater the ***rate*** of ***turn*** (degree of heading change per second), the more the gyro is precessed, resulting in greater needle deflection in the direction of turn.

2. Troubleshoting

CHART 3407. TROUBLESHOOTING TURN INDICATOR

Trouble	Cause	Remedy
Pointer fails to respond.	Foreign matter lodged in instrument.	Replace instrument.
Incorrect sensitivity.	Out of calibration.	Replace instrument.
Incorrect turn rate	Out of calibration. Aircraft not in coordinated turn. (Turn and slip indictor)	Replace instrument. Center ball in turn.
Ball sticky.	Flap spot on ball.	Replace instrument.
Ball not in center when aircraft is correctly trimmed.	Instrument not level in panel.	Level instrument.
Instrument will not indicate a turn.	No power to instrument. Instrument malfunction.	Check circuit and repair. Replace instrument.

GRIDS 2I11 AND 2I12
INTENTIONALLY LEFT BLANK

CHAPTER

37

VACUUM

2I13

CHAPTER 37 - VACUUM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
37-00-00	GENERAL	2I16	
37-00-00	Description and Operation	2I16	
37-00-00	Troubleshooting	2I16	
37-10-00	DlSTRIBUTlON	2I20	
37-10-00	Vacuum System Service Tips	2I20	
37-10-00	Hoses and Clamps	2I20	
37-10-00	Vacuum Gauges	2I20	
27-10-00	Gyro Filters	2I21	
27-10-00	Vacuum Regulator	2I21	
27-10-00	Engine Driven Vacuum Pump	2I21	
27-10-00	Removal of Engine Driven Vacuum Pump	2I22	
27-10-00	lnstallation of Engine Driven Vacuum Pump	2I22	
27-10-00	Auxiliary Vacuum Pump (Archer II,serial numbers 28-8690001 to 28-8690956, and serial numbers 289001 through 2890205. Archer III, serial numbers 2890206 and up)	2I22	
27-10-00	Auxiliary Vacuum Pump, Engine Off Operational Check	2I23	
27-10-00	Removal of Auxiliary Vacuum Pump	2I23	
27-10-00	Installation of Auxiliary Vacuum Pump	2I24	
27-10-00	Replacing Pump Fittings	2J4	
27-10-00	Vacuum Regulator Valve	2J4	
27-10-00	Adjustment of Vacuum Regulator Valve	2J4	
27-10-00	Removal and Replacement of Regulator Valve	2J5	
37-20-00	INDICATING	2J7	
27-20-00	Vacuum Gauge	2J7	
27-20-00	Removal of Vacuum Gauge	2J7	
27-20-00	Installation of Vacuum Gauge	2J7	
27-20-00	Vacuum Sensor	2J7	
27-20-00	Removal of Vacuum Sensor	2J7	
27-20-00	lnstallation of Vacuum Sensor	2J7	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

The air driven gyro instrumentation in both the Archer II and Archer III models gives quick and actual indications of airplane attitude, performance, and condition. Maintenance, other than described, must be done by the instrument manufacturer or an authorized repair station.

A. DESCRIPTION AND OPERATION

The vacuum system operates the gyro instruments and consists of an engine driven dry vacuum pump, a vacuum regulator and filter, and necessary tubing to connect components. Archer II models, serial numbers 28-69000l to 28- 8690056, and serial numbers 289000l through 2890205, have a 12 Vdc electrically operated auxiliary dry air pump system in the vacuum system, providing a backup source to operate the gyro flight instruments, if the engine driven pump fails. The auxiliary vacuum system on Archer III models, serial numbers 2890206 and up, operates on 28 Vdc. A vacuum gauge is used to constantly monitor the system. Any time vacuum pressure falls below 4.0 in. Hg, a VAC annunciator (Archer II models) or VACUUM INOP annunciator (Archer III models) will illuminate.

B. TROUBLESHOOTING

CHART 3701. TROUBLESHOOTING VACUUM SYSTEM (SHEET 1 OF 3)

TROUBLE	CAUSE	REMEDY
No vacuum gauge indication at instrument.	Open vacuum line. Faulty instrument.	Locate and repair. Replace.
No vacuum gauge indication at instrument or source.	Faulty gauge or malfunctioning pump.	Replace gauge or replace pump.
Low vacuum system indication.	Filter dirty. Vacuum regulator valve not adjusted properly. Gyros to filter line restricted. Pump to gyros line leaking	Clean or replace filter. Adjust regulator valve per Adjustments in this section. Repair or replace line. Check all lines and fittings.
Abnormal gyro precession - vacuum gauge reading correct or at maximum pressure.	Dirty filter.	Replace filter first and, if necessary, adjust regulator.

CHART 3701. TROUBLESHOOTING VACUUM SYSTEM (SHEET 2 OF 3)

TROUBLE	CAUSE	REMEDY
Normal vacuum reading, but sluggish operation of instruments.	Faulty instrument. Dirty or clogged filter or vacuum line kinked.	Replace instrument. Replace filter. Repair lines.
High system vacuum.	Vacuum regulator incorrectly adjusted. Dirty or clogged filter. Vacuum lines bent or restricted. Vacuum regulator sticking or dirty screen	Adjust regulator. Replace filter. Repair lines. Clean and check operation of regulator. Clean screen.
Regulator cannot be adjusted for correct pressure.	Line leaking. Vacuum pump malfunctioning.	Check lines and fittings. Replace pump.
Vacuum correct on ground, but not normal at altitude.	Vacuum pump malfunctioning. Regulator sticky.	Replace pump. Clean regulator.
Vacuum correct but pilot reports erratic or shows complete loss in flight.	Regulator sticky. Oil in pump due to leaky engine seal or cleaning fluid blown into pump while cleaning engine.	Clean regulator. Replace pump.
Vacuum can only be maintained at full throttle on ground.	Leak in system. Worn pump. Stuck regulator.	Repair or replace lines. Replace pump. Clean or replace regulator.
AUX ON selected on ground check and auxiliary vacuum pump will not run.	Circuit breaker open. Faulty electrical motor. Faulty contactor.	Push circuit bleaker(s) in. Isolate and check operation. Replace pump/ motor assembly if required. Check operation. Replace if required.

CHART 3701. TROUBLESHOOTING VACUUM SYSTEM (SHEET 3 OF 3)

TROUBLE	CAUSE	REMEDY
AUX ON selected on ground check and auxiliary vacuum pump will not run. (continued)	Loose or broken wire connections.	Tighten all wire connections and terminals. Check all wires for open breaks; repair as needed.
AUX ON selected on ground check and little or no vacuum is indicated; AUX ON annunciator will not light.	Leak in vacuum system.	Tighten clamps and check hoses. Replace if necessary.
	Restriction in hose lines.	Inspect and repair hose lines. Replace if necessary.
	Dirty filter.	Replace filter.
	Faulty bulb.	Replace bulb.
	Regulator not adjusted properly.	Adjust properly.
VAC OFF AUX ON annunciator switch will not engage auxiliary vacuum pump system.	Open circuit breaker.	Push circuit breaker(s) in.
	Faulty switch.	Test switch for operation. Replace if necessary
Auxiliary vacuum pump maintains correct pressure on the ground but not at altitude.	Auxiliary vacuum pump is worn.	Replace auxiliary vacuum pump assembly.
	Regulator is sticky.	Clean or replace regulator.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

DISTRIBUTION

A. VACUUM SYSTEM SERVICE TIPS

—CAUTION—

Failure to inspect vacuum system hoses, clamps, and other components periodically for leaks and security, will result in unreliable gyro instrument indications.

1. Hoses and Clamps

a. Examine hoses and clamps periodically and inspect carefully when engine maintenance requires disconnecting hose at the pump, regulating valve, gyros or vacuum gauge.

—CAUTION—

Slivers of rubber from the hoses can become detached and sucked into the pump, causing damage to the pump.

b. Examine the ends of the hoses for rubber separation and slivers of rubber on the inside diameter. The slivers can detach, enter vacuum pump, and cause premature pump service.

c. Replace hose clamps and fittings when broken, damaged, or corroded.

—CAUTION—

DO NOT USE PIPE DOPE or any other anti-seize tape or compound when replacing any of the threaded fittings The Airborne fittings are cadmium plated to avoid the need for any other anti-seize material. This will protect pump from ingesting foreign materials that will damage pump.

—CAUTION—

Immediately plug holes with shipping plugs after removing gyro instruments, or warranty will be voided due to contamination.

2. Vacuum Gauges

—NOTE—

Vacuum gauges are replaced when malfunctions occur.

a. Check vacuum gauge accuracy by comparing reading on suspect gauge with a gauge of known accuracy.

b. Visually examine gauge Performance as follows:

(1) With engine stopped and no vacuum applied to gauge, pointer should rest against internal stop in the 9 o'clock position. Replace gauge if there is any displacement from this position.

(2) A slight overshoot during engine start, not to exceed one half of an inch mercury, is normal and not cause to replace gauge.

(3) With engine operating at normal cruise rpm, gauge should read from 4.8 to 5.2 inches of mercury.
(4) At 1200 rpm, vacuum gauge reading should be more than four inches of mercury.

3. Gyro Filters

—CAUTION—

Service gyro filters on a scheduled basis, no later than 100 hours, or sooner as needed.

The system has a large central filter and a differential vacuum gauge that monitors the filter condition while giving vacuum readings.

—CAUTION—

A central filter combined with a differential vacuum gauge give a decline in panel gauge reading when filter is clogged and vacuum declines below recommended value. Filters should be replaced when gauge reading declines below recom - mended value; do not adjust regulator.

4. Vacuum Regulator

—CAUTION—

Replace regulating valve if panel gauge is checked and found to be accurate, and vacuum gauge reading does not repeat within the range of 4.8 to 5.2 inches of mercury.

—NOTE—

Regulator malfunction tends to increase vacuum power to gyros. A loss of vacuum does not occur. The gyros act as a limiting device to keep vacuum power from exceeding safe levels.

Symptoms that indicate replacement of vacuum regulating valve are:
a. Chatter as indicated by rapid fluctuation of vacuum gauge needle, or an audible sound.
b. Non-repeatability of vacuum gauge reading when panel gauge is not suspect.

B. ENGINE DRIVEN VACUUM PUMP

The vacuum pump is the rotary vane, positive displacement type. The unit consists of an aluminum housing containing a tempered sleeve in which an offset rotor is incorporated. The assembly is driven by a coupling mated to the engine driven gear assembly. The pump is mounted on the accessory section of engine.

1. Removal Of Engine Driven Vacuum Pump

a. Remove top engine cowling. (Refer to chapter 71.)
b. Loosen hose clamp and remove hose from pump fitting.
c. Remove the four retaining nuts, lock washers, and plain washers that secure pump to engine.
d. Remove pump.

2. Installation Of Engine Driven Vacuum Pump

—CAUTION—

Never install a pump that has been damaged or dropped

—CAUTION—

The only pump mounting gasket authorized and approved for use on the Airborne vacuum pump is Airborne gasket B3-1-2, Piper part number 751 859. Any other gasket could result in oil seepage or leakage at the mounting surface.

a. Place pump gasket in its proper place and align spline on pump drive with spline on engine drive assembly.
b. Secure pump to engine with four plain washers, lock washers, and retaining nuts. Tighten nuts to a torque of 50 to 70 inch-pounds. Install lock nuts.
c. Connect hoses to pump; secure with hose clamps.
d. Install engine cowling.

C. AUXILIARY VACUUM PUMP. (Archer II, serial numbers 28-8690001 to 28-8690056, and serial numbers 2890001 through 2890205 See figure 37-1.) (Archer III, serial numbers 2890206 and up.) (Refer to Figures 37-1 and 37-2)

The Auxiliary vacuum pump installation is basically the same in the Archer II and Archer III. The only differences are:

a. The Archer II has a 12 Vdc pump motor and relay, while the Archer III has a 24 Vdc pump motor and relay. (Refer to Figure 37-3.)
b. The VAC OFF AUX ON switch is on the extreme right instrument panel on the Archer II: the switch is located on the extreme left instrument panel on the Archer III.

—CAUTION—

Replace auxiliary vacuum pump/motor assembly with a new, working unit, or send unit to vendor for repair. It is important pump/motor assembly be repaired by trained personnel for proper operation.

The auxiliary vacuum pump mounted on the firewall is a backup source to operate the gyro flight instruments if the engine driven pump fails. A20 amp circuit breaker in the system protects the pump motor circuit, and a 5 amp circuit breaker protects the annunciator light switch.

1. Auxiliary Vacuum Pump, Engine Off Operational Check

—CAUTION—

Verify all electrical equipment is off before beginning engine off operational check.

—CAUTION—

Run auxiliary pump for only a short period of time. Excessive time of operation weakens battery to an unreliable charge level.

a. Press battery master switch on. Check that VAC OFF annunciator lights.
b. Press VAC OFF/AUX ON annunciator switch. Check that AUX ON annunciator lights, and VAC OFF annunciator goes out. Check that vacuum gauge reads between 4.8 and 5.2 in. hg.
c. Press VAC OFF/AUX ON annunciator switch to cycle it to the off position. Check that AUX ON annunciator goes out, and VAC OFF annunciator lights.
d. Press battery master switch off.

2. Removal of Auxiliary Vacuum Pump

—WARNING—

Verify battery master switch is OFF.

—WARNING—

Cover auxiliary vacuum pump switch on the instrument panel with an INOP placard, if a replacement auxiliary pump/motor assembly is not installed before next flight.

—CAUTION—

The auxiliary vacuum pump and motor comprise a sealed assembly and must be removed as one assembly.

—CAUTION—

The elapsed time indicator is matched to the pump/motor assembly and must be removed and replaced with the pump/motor assembly.

a. Remove top engine cowling.
b. Disconnect hoses from pump/motor assembly.
c. Disconnect electrical leads at terminals on pump/motor assembly.
d. Loosen band clamps and remove pump/motor assembly from airplane.
e. Locate elapsed time indicator under instrument panel; disconnect electrical leads.

—CAUTION—

Insulate and secure leads remaining in airplane if a replacement elapsed time indicator is not installed immediately.

f. Remove elapsed time indicator.

g. If auxiliary vacuum pump will not be installed now, place protective covers over open end of vacuum lines, insulate all electrical leads relative to the auxiliary vacuum system, and install top engine cowling.

3. Installation of Auxiliary Vacuum Pump

—WARNING—

Be sure battery master switch is OFF.

—CAUTION—

Never install a pump that has been damaged or dropped.

—CAUTION—

The elapsed time indicator is matched to the pump/motor assembly and must be removed and replaced with the pump/motor assembly.

a. Connect elapsed time indicator to two-pin connector on the leads coming from the back of the switch.

—CAUTION—

Do not locate elapsed time indicator on or near avionics or other equipment that generates a significant amount of heat.

b. Secure elapsed time indicator to wire harness with a strap; check elapsed time indicator can be easily inspected.

c. Secure excess lead wire.

d. Remove top engine cowling.

e. Mount pump motor assembly to bracket with band clamps. Do not tighten clamps.

—NOTE—

Rotate pump/motor assembly within clamps for easier installation.

f. Attach and secure electrical leads to terminals on pump motor assembly.

g. Measure hoses to obtain proper length. Cut hoses if necessary.

h. Attach and secure hoses to ports on pump/ motor assembly.

i. Position pump/motor assembly as per Figure 37-1 (Archer II) or 37-2 (Archer III).

j. Tighten clamps.

k. Install top engine cowling.

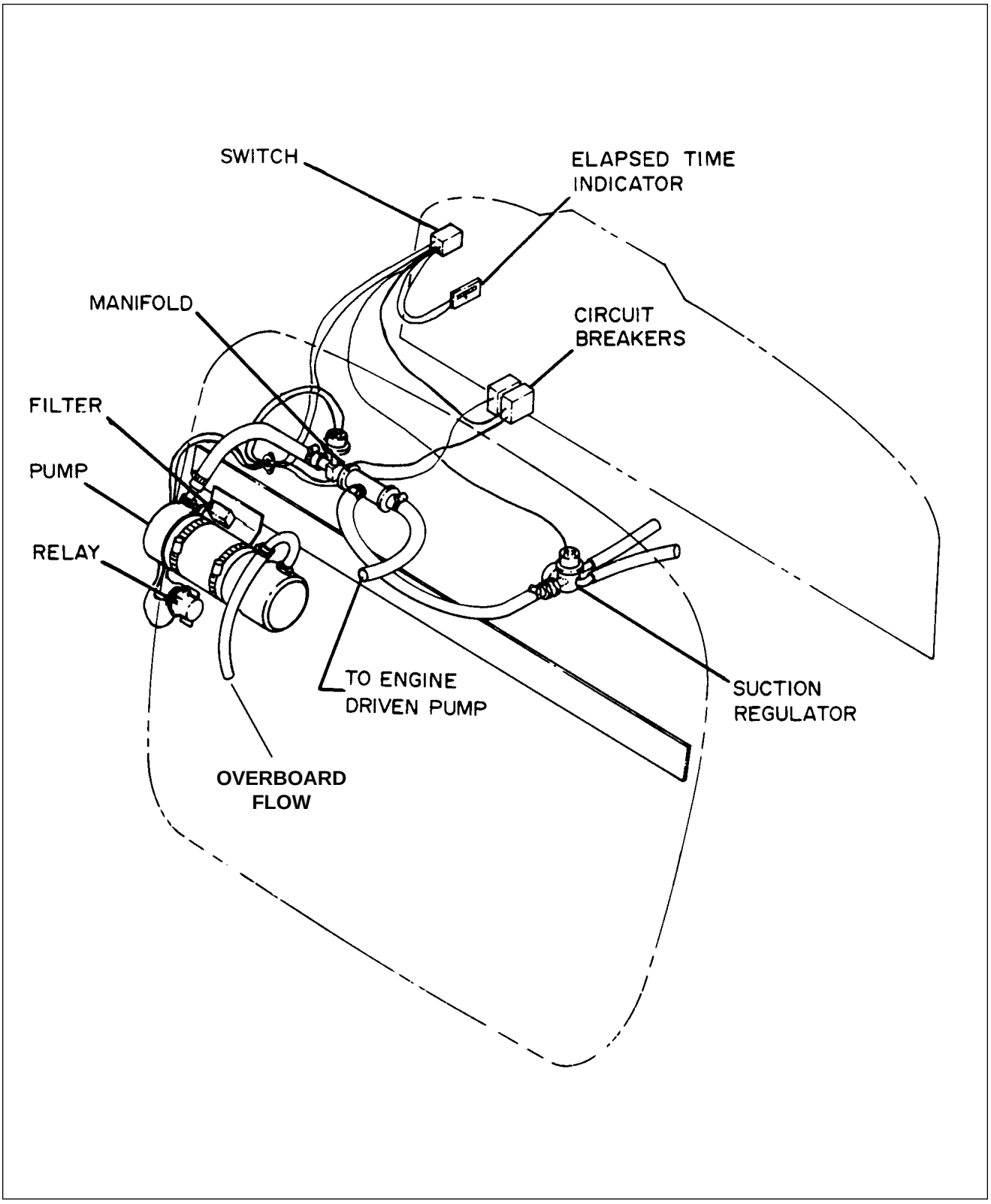


Figure 37-1. Archer II Auxiliary Vacuum Pump Installation

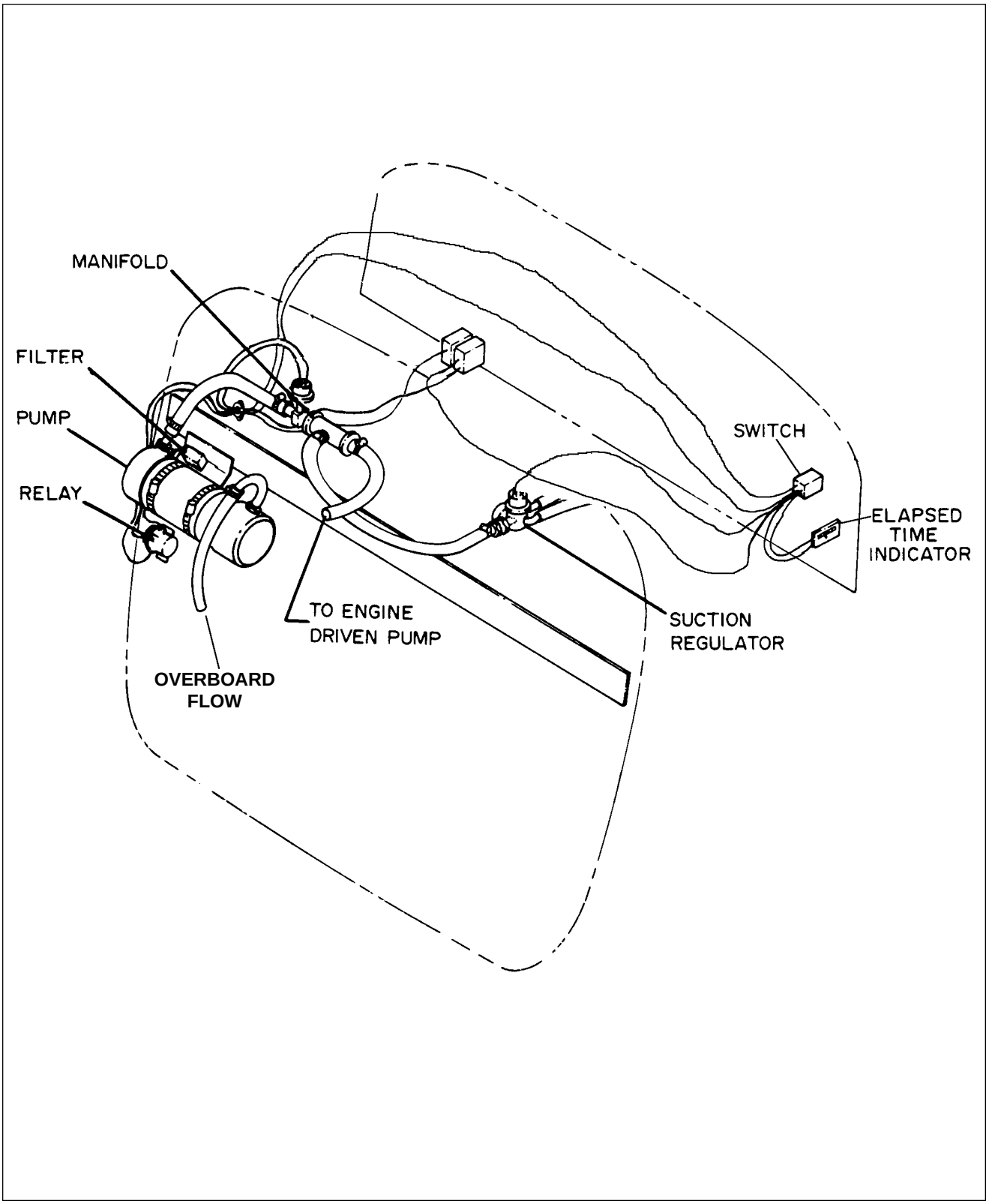


Figure 37-2. Archer III Auxiliary Vacuum Pump Installation

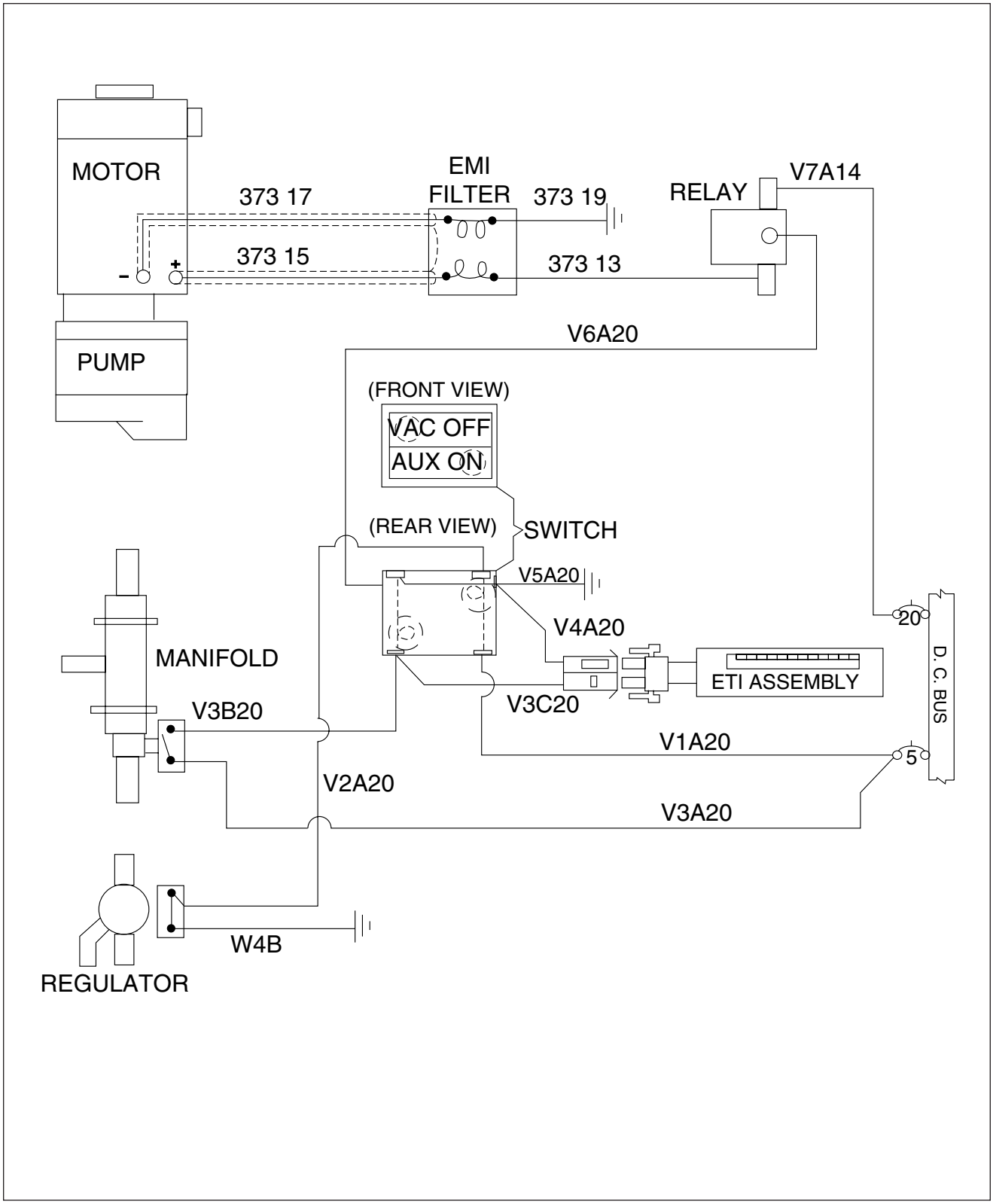


Figure 37-3. Archer II and III Auxiliary Vacuum Electrical Schematic

D. REPLACING PUMP FITTINGS

—CAUTION—

Do not place pump or motor housing in vise. Hold by hand when removing or tightening fittings.

—CAUTION—

Do not use pipe tape, thread dope, hydrocarbon oil, or grease, as these could contaminate the pump and cause malfunction.

—CAUTION—

Do not over tighten fittings. Pump case and port damage could result.

—CAUTION—

Never install a pump that has been damaged or dropped.

—CAUTION—

Check for external damage before installing any fittings on pump.

1. Install fittings into ports. Hand tighten firmly.
2. Use a wrench and tighten each fitting no more than 1-1/2 turns to align properly.

E. VACUUM REGULATOR VALVE

One vacuum regulator valve is incorporated in the system to control vacuum pressure to gyro instruments. Regulator valve is under instrument panel. Gain access to the valve for maintenance and adjustment from below instrument panel.

1. Adjustment Of Vacuum Regulator Valve

—WARNING—

Do not attempt adjustment of this valve with engine in opera - tion, without a qualified pilot or other responsible person at the controls.

—CAUTION—

Verify central air filter and vacuum lines are clean before adjusting vacuum regulator.

a. Loosen locking nut or remove protective cap from valve, per type installed.
b. Start engine. Allow time for warm-up, and run engine at medium rpm.

c. With engine running at medium rpm, suction gauge should read 5.0 ± 0.2 inches mercury. If reading is not within this range, shut down engine and adjust regulator valve (move valve adjustment screw clockwise to increase pressure, and counterclockwise to decrease pressure). Start engine and repeat check. With engine running at medium rpm, suction gauge should indicate 5.0 ± 0.2 inches mercury. If airplane is not equipped with suction gauge, connect a gauge by removing the plug from back of the artificial horizon, and attaching a temporary gauge.
d. Restart the engine and repeat the check.
e. After system pressure is adjusted to 5.0 ± 0.2 inches mercury, remove gauge and install plug, replace protective cap, or tighten locknut, per type valve installed.

2. Removal And Replacement Of Regulator Valve

a. Disconnect the three lines and remove mounting nut. Remove valve from airplane.
b. Install regulator in reverse order of removal.
c. Check complete vacuum system for proper operation.

THIS SPACE INTENTIONALLY LEFT BLANK

GRIDS 2J5 AND 2J6
INTENTIONALLY LEFT BLANK

INDICATING

A. VACUUM GAUGE

The vacuum gauge is mounted on the right side of the Archer II instrument panel, and on the left side of the Archer III instrument panel. The gauge is calibrated in inches of mercury and reads the amount of vacuum (negative pressure) in the system. The vacuum gauge has a direct vacuum (negative pressure) line and vent line, and reads the differential pressure or actual negative pressure being applied to the gyro instruments.

1. Removal of Vacuum Gauge

a. Gain accesss to gauge from under instrument panel.
b. Lossen hose clamps on back side of gauge.
c. Remove hoses.
d. Remove and retain the 4 screws securing gauge in panel. Remove gauge.

2. Installation of Vacuum Gauge.

a. Position gauge in instrument panel. Secure with the 4 screws retain during removal.
b. Attach hoses and tighten clamps.
c. Check gauge is operating properly by engaging the BATT MSTR and LOW VAC AUX ON switches. Gauge should read 5.0 ± 0.2 inches of Hg.

B. VACUUM SENSOR

1. Removal of Vaacuum Sensor

Gain access to the sensor unit by reaching up under the instrument panel to the vacuum regulator. Remove as follows:

a. Disconnect the two electrical leads.
b. Unscrew sensor unit from vacuum regulator.
c. Cover hole to prevent foreign matter from entering regulator.

2. Installation of Vaacuum Sensor

a. Screw sensor unit into vacuum regulator.
b. Connect the two electrical leads.
c. Perform operational check.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

39

ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS

2J9

CHAPTER 39 - ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
39-10-00	INSTRUMENT AND CONTROL PANELS	2J12	
39-10-00	Removal and Replacement of Face Mounted Instruments	2J12	
39-10-00	Archer II	2J12	
39-10-00	Archer III	2J12	
39-10-00	Removal and Replacement of Cluster Mounted Instruments	2J12	
39-40-00	MULTI-PURPOSE ELECTRICAL AND ELECTRONIC PARTS	2J15	
39-40-00	Electrical Switches and Circuit Breakers	2J15	
39-40-00	Archer II	2J15	
39-40-00	Removal of Electrical Switches	2J15	
39-40-00	Installation of Electrical Switches	2J15	
39-40-00	Archer III (SN/’s 2890206 and up)	2J15	
39-40-00	Top Remove Overhead Panel Switch(es)	2J15	
39-40-00	Top Install Overhead Panel Switch(es)	2J16	
39-40-00	Top Remove Avionics or Pitot Heat Switch(es)	2J16	
39-40-00	Top Install Avionics or Pitot Heat Switch(es)	2J16	
39-40-00	Circuit Breakers	2J16	
39-40-00	Removal of Circuit Breakers	2J16	
39-40-00	Installation of Circuit Breakers	2J17	

—NOTE—

Refer to chapter 91 for electrical schematics.

THIS PAGE INTENTIONALLY LEFT BLANK

INSTRUMENT AND CONTROL PANELS

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft.

A. REMOVAL AND REPLACEMENT OF FACE MOUNTED INSTRUMENTS

—CAUTION—

Handle instruments with care to avoid instrument damage.

1. Archer II

a. Remove face panel by removing the screws from around panel perimeter.
b. With face panel removed, mounting screws for individual instruments will be exposed. Remove the connections to the instrument before removing instrument mounting screws.

—NOTE—

Tag instrument connections to aid installation.

c. Install instruments by reversing removal instructions. After installation and before replacing instrument face panel, check all components for security and control column clearance.

2. Archr III

—NOTE—

Tag instrument connections to aid installation.

a. Removal

(1) Remove all connections to the instrument
(2) Remove and retain screws securing instrument to the panel.
(3) Remove instrument.

b. Installation

(1) Position instrument in panel.
(2) Secure instrument to panel with the screws retained during removal.
(3) Install all inxtrument connections.

B. REMOVAL AND REPLACEMENT OF CLUSTER MOUNTED INSTRUMENTS

The instrument cluster, which contains six individual instruments, is installed on the Archer II instrument panel only.

Remove the instrument cluster as follows:

1. Remove face panel by removing screws from around the panel perimeter.
2. With face panel removed, the clear plastic cover on the cluster assembly will be exposed. Remove cover and cluster by removing six mounting screws.

— CAUTION —

If removing or replacing amp meter, refer to the latest revision of Piper Service Bulletin No. 811.

3. Remove the connection to the individual instrument and remove instrument from cluster assembly.
4. Replace instruments by reversing removal instructions. Check all mountings and connections for security.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

MULTIPURPOSE ELECTRICAL AND ELECTRONIC PARTS

A. ELECTRICAL SWITCHES

1. Archer II

The Archer II main electrical switches are rocker type, which are mounted in the middle of the instrument panel.

a. Removal Of Electrical Switches

(1) Disconnect ***positive*** battery cable.
(2) Remove Royalite cover panel.
  (a) The Royalite cover panel has a ridge along the top and bottom that fits into flanges in the main Royalite cover panel. Remove Royalite panel covering switches by compressing the top or bottom until the ridge on the switch cover panel clears the flange in the main panel.
(3) Remove the screws above and screw below switch on front of the instrument panel.
(4) Remove switch from behind instrument panel.

—NOTE—

Note placement of electrical leads to aid installation.

(5) Disconnect electrical connections.

b. Installation Of Electrical Switches

(1) Attach electrical leads with mounting screws to their proper place on back of switch.
(2) From behind instrument panel, insert switch into its designated slot and secure with the two screws previously removed.
(3) Install Royalite cover by inserting top or bottom ridge into appropriate flange on main Royalite cover. Compress cover until remaining ridge fits into appropriate flange.
(4) Connect ***positive*** battery cable.

2. Archer III (S/N's 2890206 and up)

The main electrical switches on the Archer III are back lit rocker type, which are mounted in an overhead panel. Avionics and pitot heat rocker type switches are mounted in the lower center instrument panel. The switches in both location are snap-in type.

a. To Remove Overhead Panel Switch(es)

(1) Disconnect ***positive*** battery cable.
(2) Remove switch panel by:
  (a) Removing and retain the 6 panel attaching screws.
  (b) Disconnecting the two electrical connectors.
(3) Remove desired switch(es) by:
  (a) Squeezing on upper and lower retaining clips and pushing switch through front of panel

—NOTE—

Note placement of electrical leads to aid installation.

  (b) Disconnecting electrical leads on back of switch.

b. To Install Overhead Panel Switch(es)

(1) With electrical leads extending through switch hole in panel, attach electrical leads with mounting screws to their proper place on back of switch.
(2) Position switch in proper location and, while squeezing on lower and upper retaining clip, push in on switch until it "snaps" into place.
(3) Position panel in proper overhead location and connect the two electric connectors.
(4) Secure with the 6 screw preciously removed.
(5) Connect ***positive*** battery cable.

c. To Remove Avionics or Pitot Heat Switch(es)

(1) Disconnect ***positive*** battery cable.
(2) Reach behind instrument panel and, while squeezing on the upper and lower clips, push switch out through front of panel.

—NOTE—

Note placement of electrical leads to aid installation.

(3) Disconnect electrical connections on back of switch(es)

d. To Install Avionics or Pitot Heat Switch(es)

(1) With electrical leads extending through switch hole in panel, attach electrical leads with mounting screws to their proper place on back of switch.
(2) Position switch in proper location and, while squeezing on lower and upper retaining clip, push in on switch until it "snaps" into place.
(3) Connect ***positive*** battery cable.

B. CIRCUIT BREAKERS

Circuit breakers are single hole mounting, push button type with manual reset; they must be reset by pilot if tripped. They are on a circuit breaker panel on lower right corner of instrument panel. The circuit breaker buttons on the Archer II are flush with the face of the breaker panel when they are ON (in position). Archer III breaker buttons protrude approximately 1/2 inch when ON (in position). The circuit breakers on both models are removed and installed in a similar manner.

1. Removal Of Circuit Breakers

a. Disconnect positive battery cable.
b. Remove knurl nut from circuit breaker face plate on front of instrument panel.
c. From behind instrument panel, disconnect electric bus bar from circuit breaker.
d. From behind instrument panel, remove circuit protector from instrument panel.

—NOTE—

Note placement of electrical leads to aid installation.

d. Disconnect electrical connections fastened with screws to circuit breaker.

2. Installation Of Circuit Breakers

a. Check circuit breaker amperage is correct.
b. Connect electrical leads to their proper screws on new breaker and secure.
c. From behind instrument panel, insert circuit protector into its proper hole on instrument panel.
d. From behind instrument panel, install electric bus bar to circuit breakers.
e. Fasten and tighten knurl nut to circuit breaker face plate on front of instrument panel.
f. Connect positive battery cable.
g. Activate circuit protected by replaced breaker. Check appropriate electrical items are functioning.

—NOTE—

Refer to chapter 91 for electrical schematics.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

51

STRUCTURES

2J19

CHAPTER 51 - STRUCTURES

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
51-00-00	GENERAL	2J22	
51-00-00	Description	2J22	
51-10-00	STRUCTURAL REPAIRS	2J24	
51-10-00	Baggage Compartment Inspection Hole and Cover Plate	2J24	
51-10-00	General	2J24	
51-10-00	Baggage Compartment Inspection Holes Fabrication Procedure	2J24	
51-10-00	Fiberglass Repairs	2K1	
51-10-00	Minor Scratch and Crack Repair	2K1	
51-10-00	Hole Repair	2K5	
51-10-00	Fiberglass Fracture and Patch Repairs	2K5	
51-10-00	Adding Layers to Undamaged Areas	2K6	
51-10-00	General Thermoplastic Repairs	2K7	
51-10-00	Surface Preparation	2K7	
51-10-00	Surface Scratches, Abrasions, or Ground-In Dirt	2K8	
51-10-00	Deep Scratches, Shallow Nicks, and Small Holes (Less than 1 inch in diameter)	2K8	
51-10-00	Cracks	2K10	
51-10-00	Repairing Major Damage: (Larger than 1 inch in diameter)	2K10	
	Stress Lines	2K10	
51-10-00	Painting the Repair	2K14	
51-10-00	A.B.S. Thermoplastic Landing Gear Wheel and Strut Fairing Repair Instructions	2K14	
51-10-00	Safety Walk Repair	2K14	
51-10-00	Surface Preparation	2K14	
51-10-00	Product Listing for Liquid Safety Walk Compound	2K14	
51-10-00	Application of Liquid Safety Walk Compound	2K15	
51-10-00	Surface Preparation for Pressure Sensitive Safety Walk	2K15	
51-10-00	Application of Pressure Sensitive Safety Walk	2K15	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft.

DESCRIPTION

The PA-28-181, Archer II and Archer II airplanes, are an all metal semi-monocoque structure. The fuselage is constructed of bulkheads, stringers, and stiffeners, to which all of the outer skin is riveted. The cabin entrance door is on the right side of fuselage above the wing. Wings and empennage are all metal, full cantilever semi-monocoque type construction with removable tips.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

STRUCTURAL REPAIRS

Structural repair methods used must be made per regulations in latest revision FAA Advisory Circular 43.13. To aid repair and/or replacement, Figure 51-1 identifies the type and thickness of various skin material used.

— WARNING—

No access holes are permitted in any control surfaces The use of patch plates for repair of movable tail surfaces is prohibited. The use of filler material, normally used for repair of minor dents, or materials used for filling the inside of surfaces, is also prohibited on all movable tail surfaces.

Never make a skin replacement or patch plate from material other than the type of original skin, or of a different thickness than original skin. The repair must be as strong as the original skin. Flexibility must be retained so surrounding areas will not receive extra stress.

A. BAGGAGE COMPARTMENT INSPECTION HOLE AND COVER PLATE

1. General

Archer II airplanes, manufactured before 1979, may not have had control cable inspection access holes in the baggage compartment floor. The following is a method of fabricating inspection access holes in the floor of the baggage compartment, if desired.

2. Baggage Compartment Inspection Holes Fabrication Procedure (Refer to Figure 51-2)

While Figure 51-2 shows the hole in the left side of the baggage compartment, a similar hole is also cut out in the right side baggage compartment floor. Installation will require two each inspection access covers, Piper P/N 62109-0.

a. Layout cut lines
   (1) Gain access to baggage compartment.
   (2) ***Carefully*** remove:
      (a) Right side baggage compartment Royalite plastic close out panel.
      (b) Rear close out panel.
      (c) Carpeting from baggage compartment floor.
   (3) Determine and mark a reference center line running through baggage compartment. Refer to Figure 51-2 for measurements.
   (4) Measure two points 14.99 inches each side of the reference centerline. Joining these two points will form the centerlines of each inspection hole.
   (5) Measure two points on each side of each centerline of both holes at distances of 8.48 inches and 10.98 inches from the aft edge of the baggage compartment floor.
   (6) Connect the two 8.48” points and the two 10.98” points so that the resulting lines cross the centerline of each hole.
   (7) Using the intersection of the lines constructed in step (6) with each hole’s centerline as the center, scribe an arc having a radius of 2.00”
   (8) Draw a line (four lines total) tangent to the each side of the arcs constructed on step (7).
   (9) There should now be two ovals, like the one in Figure 51-2, laid out on each side of the baggage compartment floor.

b. Cutting the holes.

— CAUTION —

Baggage compartment flooring is made of 0.025 inch thick aluminum. Use care when cutting through flooring so as not to damage cables and wiring routed below the floor.

(1) Drill a 1/4 inch hole inside of, and adjacent to, one of the scribed lines layed out for each hole.
(2) Using a 1/8 inch router bit, cut out the two inspection holes by following the lines layed out on each side of the baggage compartment floor.
(3) Deburr each cut edge using a file or emery wheel.

c. Installing covers.
(1) Lay one of the 62109-0 covers over one of the inspection holes. Using the screw holes in the cover, scribe the position for the screw holes on the baggage compartment floor.
(2) Drill a 0.120 inch hole in baggage compartment floor at each position layed out in step (1).
(3) Attach cover to flooring with No.8 X 0.38 corrosion resistant steel sheet metal screws.
(4) Repeat steps (1) through (3) on remaining hole.

d. Install baggage compartment rear and side close out panels.
e. Install baggage compartment floor rug.

B. FIBERGLASS REPAIRS

The repair procedure in this manual describes repair methods for fiberglass reinforced structures, fiberglass touch-up and surface repairs (blisters, open seams, delamination, cavities, small holes, and minor damages) that have not harmed the fiberglass cloth material, and fiberglass fracture and patch repairs (puncture, breaks, and holes that have penetrated through the structure and damaged the fiberglass cloth). A repair kit, part number 766 222 gives necessary material for such repairs, and is available from Piper Aircraft dealers.

—CAUTION—

Follow resin and catalyst mixing instructions furnished with repair kit.

— NOTE —

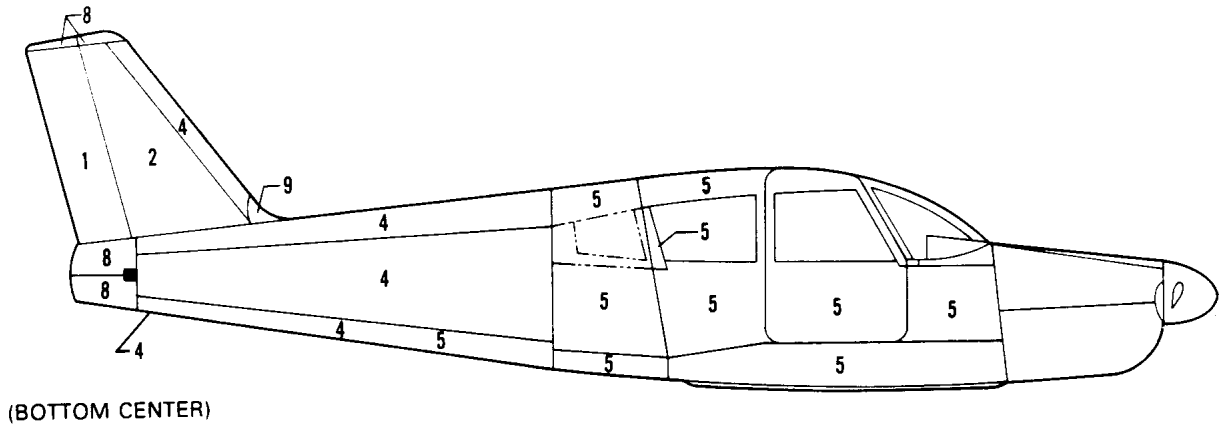
Polyester resin has a limited storage life and the material should not be used if gelatin or hard lumps are found in container. Storage life may be extended by refrigeration.

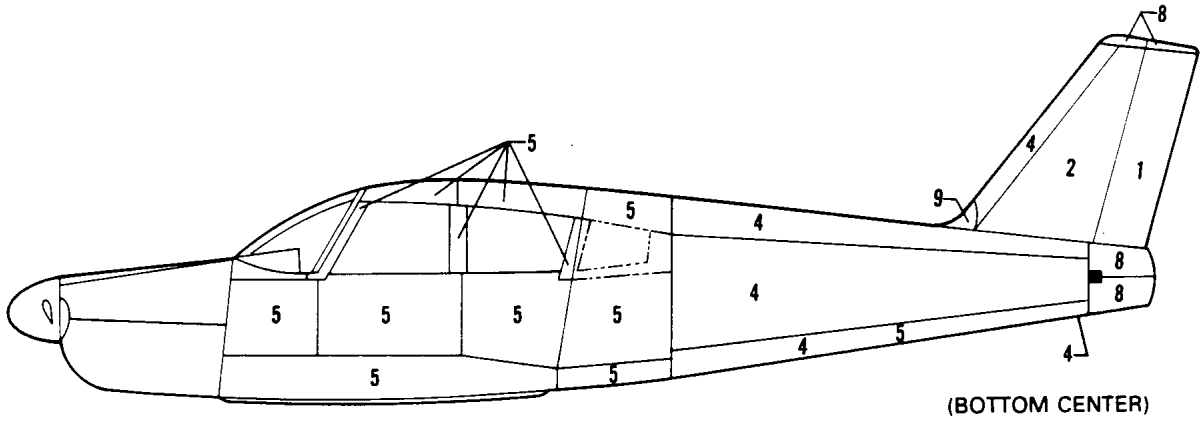
— NOTE —

The following repaires are not intended for use on glue joints.

1. Minor Scratch and Crack Repair

a. Remove wax, oil, and dirt from around damaged area with acetone, methylethylketone, or equivalent and remove paint to gel coat.





LOCATION	MATERIAL	THICKNESS
1	2024-T3	0.016
2	2024-0(1)	0.020
3	2024-T3	0.020
4	2024-T3	0.025
5	2024-T3	0.032
6	2024-T3	0.040
7	2024-T3	0.051
8	FIBERGLASS	
9	THERMOPLASTIC	
10	2024-0(2)	0.020
11	2024-0(3)	0.025

Figure 51-1. Skin Materials and Thickness
(Sheet 1 of 2)

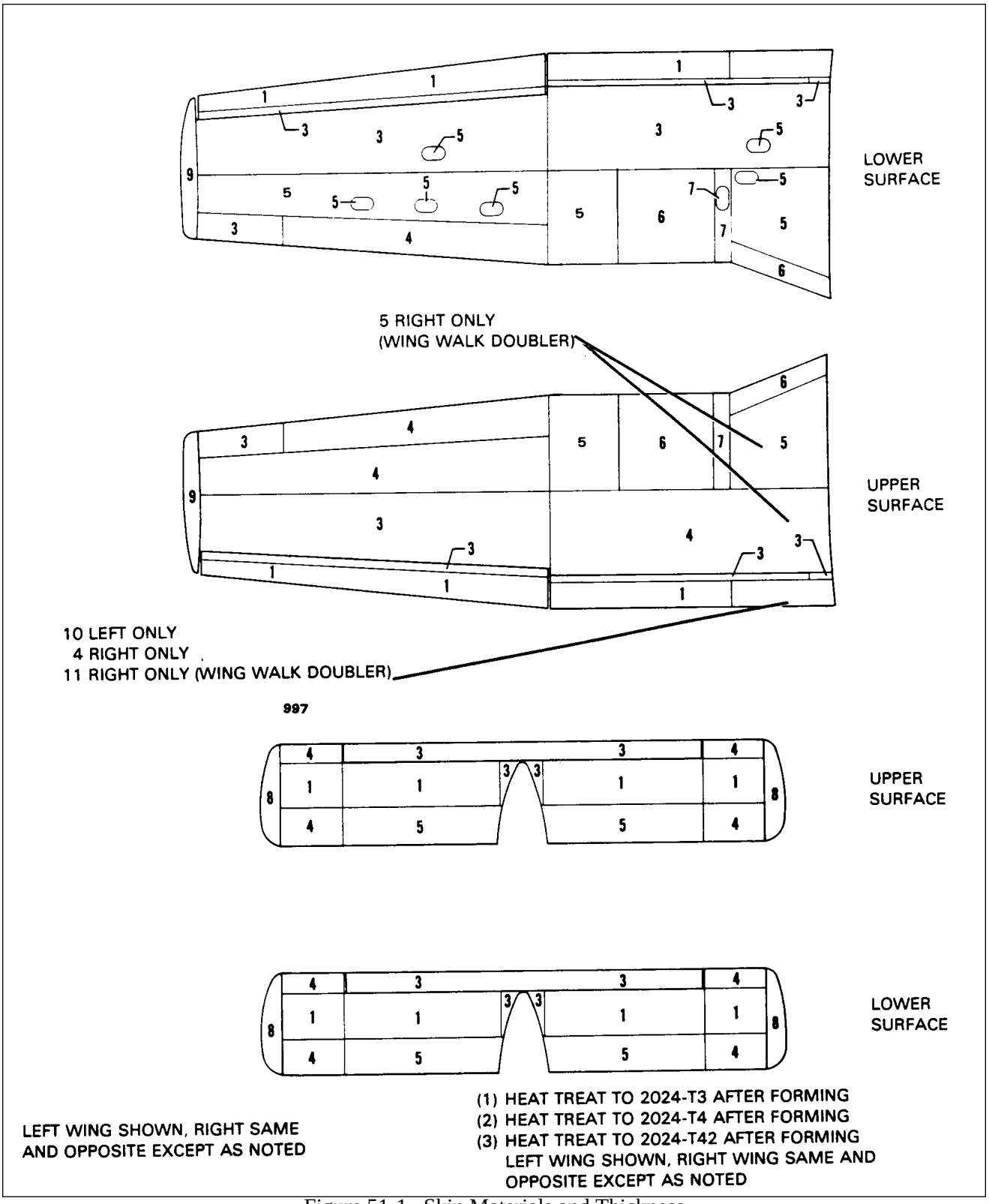

LOWER SURFACE
5 RIGHT ONLY
(WING WALK DOUBLER)
UPPER SURFACE
10 LEFT ONLY
4 RIGHT ONLY
11 RIGHT ONLY (WING WALK DOUBLER)
997
UPPER SURFACE
LOWER SURFACE
LEFT WING SHOWN, RIGHT SAME
AND OPPOSITE EXCEPT AS NOTED
(1) HEAT TREAT TO 2024-T3 AFTER FORMING
(2) HEAT TREAT TO 2024-T4 AFTER FORMING
(3) HEAT TREAT TO 2024-T42 AFTER FORMING
LEFT WING SHOWN, RIGHT WING SAME AND
OPPOSITE EXCEPT AS NOTED

Figure 51-1. Skin Materials and Thickness
(Sheet 2 of 2)

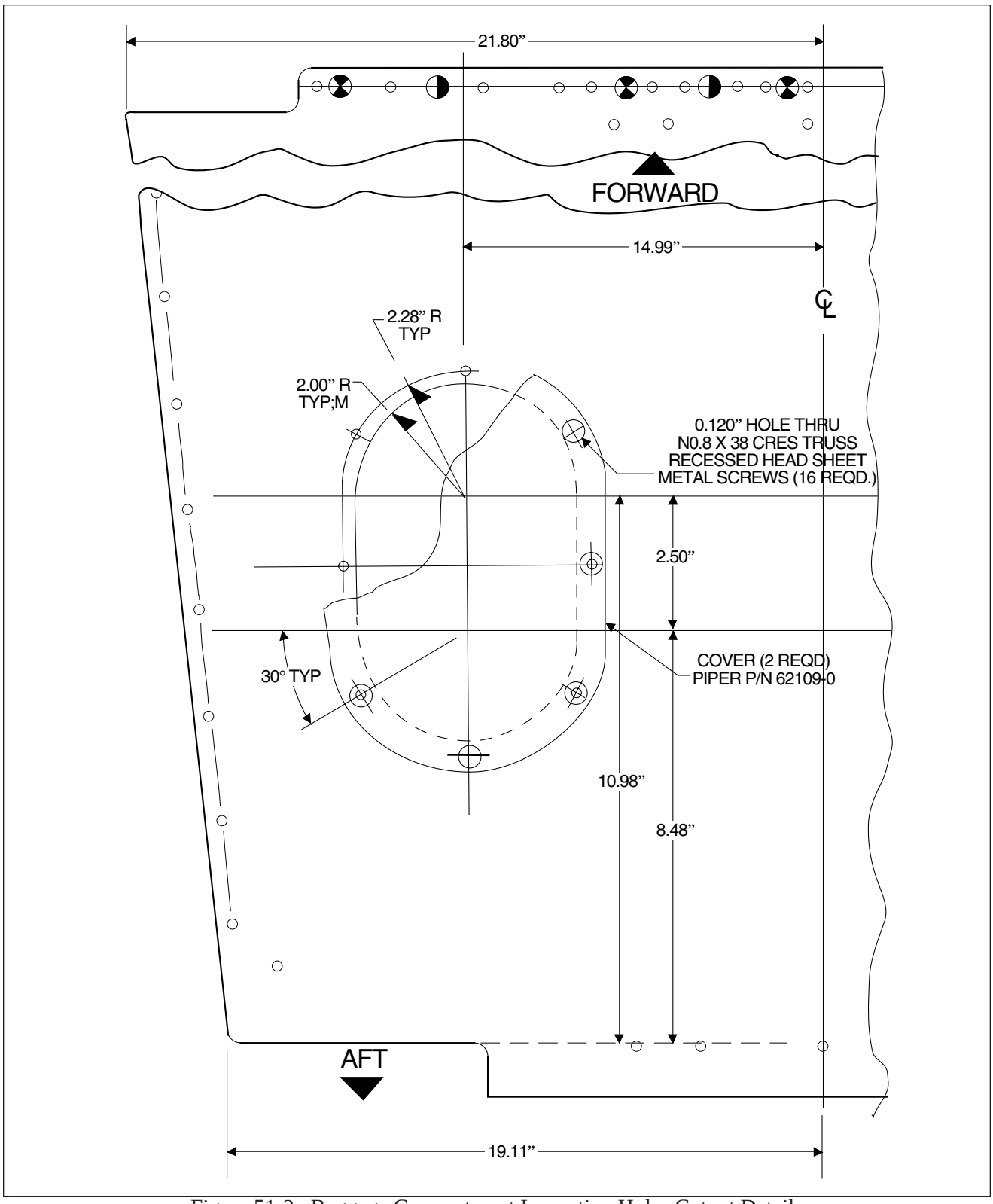


Figure 51-2. Baggage Compartment Inspection Holes Cutout Details

b. Scrape damaged area with a fine blade knife or a power drill with burr attachment to roughen bottom and sides of damaged area. Feather edge surrounding scratch or cavity. Do not undercut edge. (If scratch or cavity is shallow and penetrates only the surface coat, continue to step 2, b.)
c. Pour a small amount of resin into a jar lid or on a piece of cardboard, enough to fill damaged area. Mix equal amount milled fiberglass with resin, (use a putty knife or stick. Add catalyst per kit instruction, to resin and mix thoroughly. Use a hypodermic needle to inject gel into small cavities not requiring fiberglass millings mixed with gel.
d. Work mixture of resin, fibers, and catalyst into damaged area. Use sharp point of putty knife or stick to press it into bottom of hole and puncture any air bubbles. Fill scratch or hole above surrounding undamaged area about 0.062 (1/16) of an inch.
e. Lay a piece of cellophane or waxed paper over repair to block air and start cure of gel mixture.
f. Allow gel to cure 10 to 15 minutes until it is rubbery to touch. Remove cellophane and trim flush with surface, using a sharp razor blade or knife. Replace cellophane and cure completely for 30 minutes to an hour. Patch will shrink below structure surface as it cures. (If wax paper is used, check wax is removed from surface.)

2. Hole Repair

a. Rough up hole bottom and edges with electric burr attachment or rough sandpaper. Feather hole into surrounding gel coat, do not undercut.
b. Pour out a small amount of resin, add catalyst, and mix thoroughly (use a cutting motion rather than stirring). Use no fibers.
c. Using tip of a putty knife or fingertips, fill hole to about one-sixteenth of an inch above surrounding surface with gel coat mixture.
d. Lay cellophane over patch to start curing process. Repeat step f, trimming patch when partially cured.
e. After trimming patch, immediately place small amount of gel coat on cut edge of patch and cover with cellophane. Use a squeegee or the back of a razor blade, squeegee level with area surrounding patch. Leave cellophane on patch for 1 or 2 hours or overnight for complete cure.
f. After repair has cured 24 hours, sand patched area using a sanding block with fine wet sandpaper. Finish by priming, sand again, and apply color coat.

3. Fiberglass Fracture And Patch Repairs

a. Remove wax, oil, and dirt from damaged area with acetone, methylethylketone, or equivalent.
b. Use a key hole saw, electric saber saw, or sharp knife to cut away ragged areas. Cut back to sound material.
c. Remove paint three inches back from damaged area.
d. Use 80-grit dry paper and working inside the structure, bevel edges to approximately a 30 degree angle and rough-sand hole and area around it. Feather back for about two inches all around hole to roughen surface for strong bond with patch.
e. Cover a piece of cardboard or metal with cellophane. Tape it to outside of structure. Completely cover hole. Cellophane must face toward inside of structure. Repair to a sharp contour or shaped area requires a sheet of aluminum formed to a similar contour to be placed over area. The aluminum must be covered with cellophane.
f. Prepare a patch of fiberglass mat and cloth to cover area two inches larger than hole.
g. Mix small amount of resin and catalyst, (enough for one step) per kit instructions.

h. Thoroughly wet mat and cloth with catalyzed resin. Daub resin to mat, then to cloth. Mat must be placed on structure surface with cloth on top. Use enough fiberglass cloth and mat reinforcements to maintain the original surface strength. Use extra layers of cloth if the damage was a stress crack.

i. Lay patch over hole (inside of structure). Cover with cellophane, and squeegee from center to edges to remove all air bubbles. Air bubbles will show white and must all be worked out to edge. Remove excess resin before it gels. Allow patch to cure completely.

j. Remove cardboard or aluminum sheet from outside of hole and rough-sand patch and hole edge. Feather edge of hole about two inches into undamaged area.

k. Mask area around hole with tape and paper to protect surface. Cut a piece of fiberglass mat about one inch larger than hole. Cut one or more pieces of fiberglass cloth two inches larger than hole. Brush catalyzed resin over hole. Lay mat over hole and wet out with catalyzed resin. Brush with a daubing action. Then apply additional layer or layers of fiberglass cloth to build up patch to surface of structure. Wet out each layer thoroughly with resin.

l. Work out all air bubbles in patch using a squeegee or broad knife. Work from center to edge pressing patch firmly against structure. Allow patch to cure 15 to 20 minutes.

m. As soon as the patch begins to set up, but while it is still rubbery, use a sharp knife and cut away extra cloth and mat. Cut on outside edge of feathering. Strip cut edges of structure before cure is complete to save extra sanding. Allow patch to cure overnight.

n. Use dry 80-grit sandpaper on a power sander or sanding block to smooth patch and blend with surrounding surface. Should air pockets appear while sanding, puncture and fill with catalyzed resin. A hypodermic needle may be used to fill cavities. Let cure and sand.

o. Mix catalyzed resin and work into patch with fingers. Smooth carefully and work into crevices.

p. Cover with cellophane and squeegee smooth. Cure completely before removing cellophane. Sand the area.

q. Brush or spray catalyzed resin to seal patch. Sand and finish by priming. Sand again and apply color coat.

—NOTE—

Clean brush and hands in solvent such as acetone. Use a strong solution of detergent and water if solvents are not available.

4. Adding Layers to Undamaged Areas.

a. Rough sand area to be laminated with 80 grit dry sandpaper.

b. Th oroughly clean area to be laminated with acetone, MEK, or equivalent.

c. Mix resub abd catalysts accordig to the manufacturers instructions. Mix only enough to be used one step at a time.

d. Thouroughly wet fiberglass cloth with catalyzed resin. Lay cloth on part and squeegee from center to edges of cloth to remove all air bubbles, and to assurte adhesion. Air bubbles will show white and all should be worked out to the edge. Remove excess resin before it gels on the part.

e. Repeat step d until the desired number of cloth lay ers have been added.

f. Alllow parts to cure for 24 hours at room temperature.

g. After part has cured it may be sanded and painted as required.

C. GENERAL THERMOPLASTIC REPAIRS

— WARNING —

Common safety precautions must be followed when using the materials and tools for these repairs.

Thermoplastic material is used throughout the airplane except for wheel and strut fairings. Check the following list of materials and vendors to aid in thermoplastic repairs.

CHART 5101. LIST OF MATERIALS FOR THERMOPLASTIC REPAIR

ITEMS	DESCRIPTIONS	SUPPLIERS
Buffing and Rubbing Compounds.	Automotive Type - DuPont #7.	DuPont Company Wilmington. Del. 19898
	Ram Chemical #69 x 1.	Ram Chemicals Gardena, CA 90248
	Mirror Glaze #1.	Mirror Bright Polish Co., Inc. Irvin, CA 92713
Cleaners.	Fantastic Spray. Perchlorethylene. VM&P Naphtha (lighter fluid).	Local suppliers
ABS-Solvent Cements.	Solarite #11 Series.	Solar Compounds Corp. Linden, N.J. 07036
Solvents.	Methylethylketone. Methylene Chloride.	Local suppliers
Epoxy Patching Compound.	Solarite #400.	Solar Compounds Corp. Linden, N.J. 07036
Hot Melt Polyamids Adhesives and Hot Melt Gun.	Stick Form 1/2 in. dia., 3 in. long.	Sears Roebuck & Co. or local hardware stores.
Hot Air Gun.	Temp. Range 300° to 400° F.	Local suppliers.

1. Surface preparation:

a. Remove surface dirt and paint from item being repaired. Household cleaners are effective in removing surface dirt.
b. Cleaning damaged area with perchlorethylene or VM&P Naptha will give a good bond between epoxy compounds and thermoplastic.

2. Surface scratches, Abrasions or Ground-in-Dirt: (Refer to Figure 51-3.)

a. Shallow scratches and abraded surfaces are repaired using conventional automotive buffing and rubbing compounds

—CAUTION—
When using a hot air gun, be careful not to overheat the thermoplastic.

b. Remove large dirt particles embedded in thermoplastic parts with a hot air gun capable of heating to 300° to 400° F. Hold nozzle of gun about 1/4 inch away from surface and apply heat with a circular motion until area is sufficiently soft to remove dirt particles.

c. Thermoplastic will return to its original shape upon cooling.

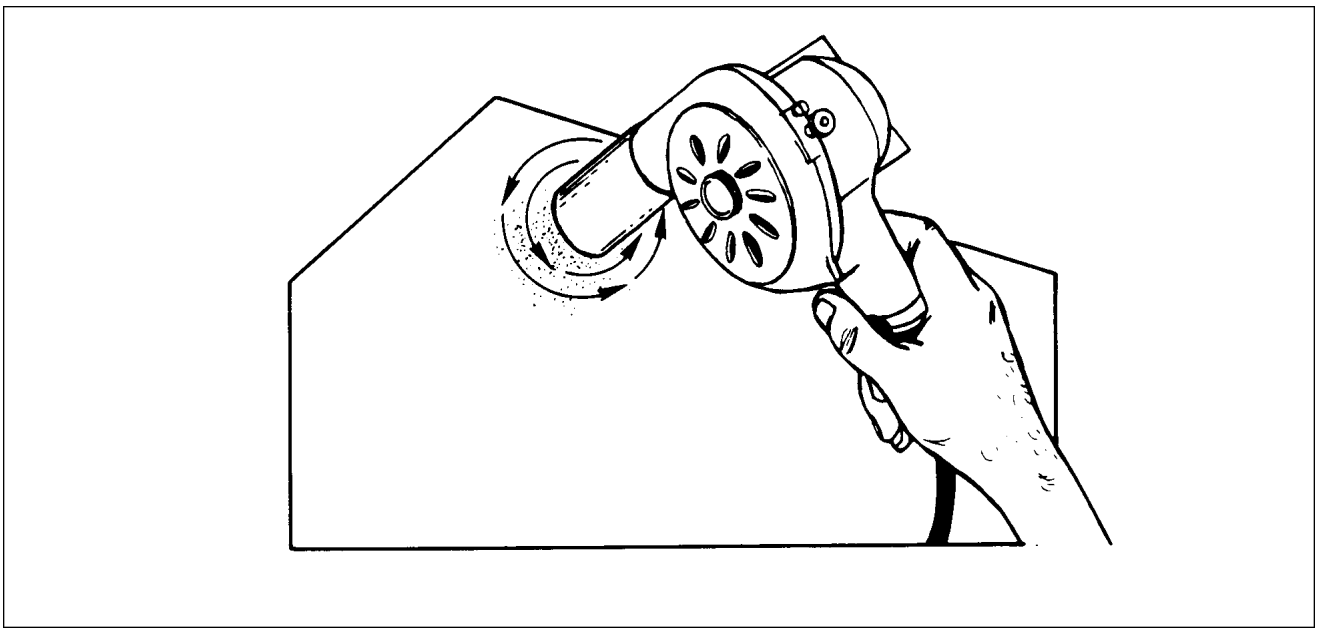


Figure 51-3. Surfaces Scratches, Abrasions or Ground-In Dirt

3. Deep Scratches, Shallow Nicks, and Small Holes: (Less than 1 inch in diameter.) (Refer to Figure 51-4.)

a. Solvent cements will fit most applications. For small repairs make a satisfactory cement by dissolving thermoplastic material of same type being repaired in solvent until desired paste-like consistency is achieved.

b. Apply mixture to damaged area. When the solvent evaporates, the hard solids remaining can easily be shaped to desired contour by filing or sanding.

c. Do not use solvent adhesives for highly stressed areas, thin walled parts, or for patching holes greater than 1/4 inch in diameter.

d. For larger damages, use an epoxy patching compound. This type material is a two part, fast curing. easy sanding commercially available compound.

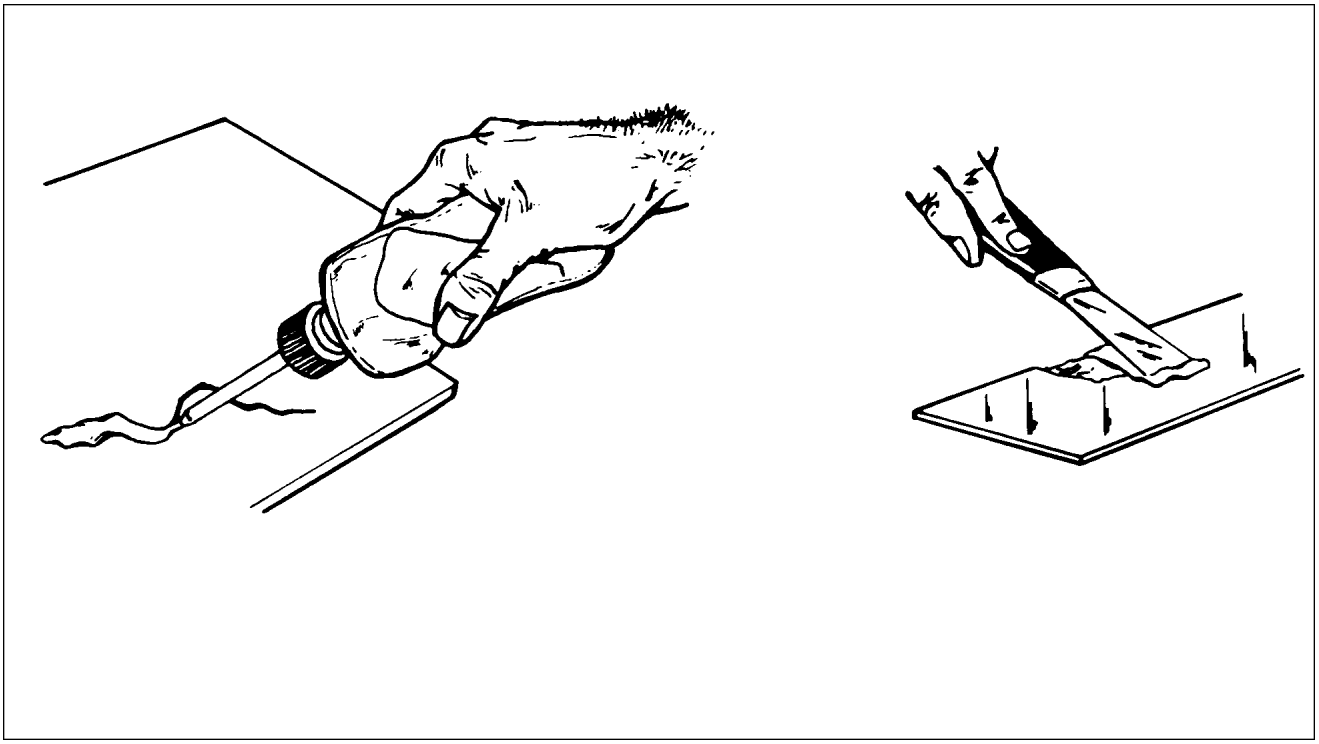


Figure 51-4. Deep Scratches, Shallow Nicks and Small Holes

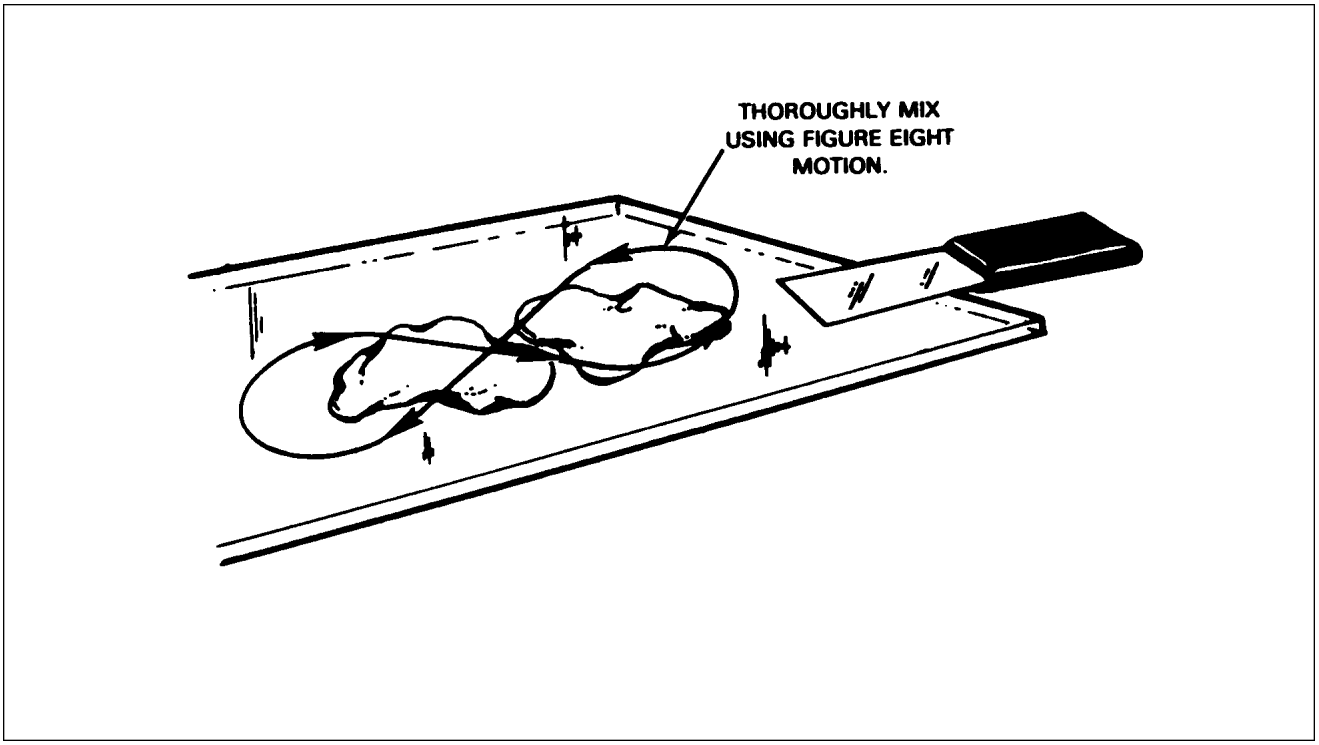


Figure 51-5. Mixing of Epoxy Patching Compound

—NOTE—

Increase adhesion by roughing bonding surface with sandpaper and by using as much surface area for bond as possible.

e. Mix patching compound in equal portions on a hard flat surface (use a figure eight motion). Clean damaged area with perchlorethylene or VM&P naphtha prior to applying compound (figure 51-5).
f. Use a mechanical sander after compound is cured. Keep sander in constant motion to prevent heat buildup.
g. For repairs in areas involving little or no shear stress, use hot melt adhesives (polyamids) supplied in stick form. This type of repair has a low cohesive strength factor.
h. For repairs in areas involving small holes, indentations, or cracks in material where high stress is apparent, or thin walled sections are used, welding method is suggested.
i. The welding method requires a hot air gun and ABS rods. To weld, hold gun to direct the flow of hot air into repair zone. Heat damaged area and rod simultaneously. Move the gun continuously in a fanning motion to prevent discoloration of material. Pressure must be maintained on rod to ensure good adhesion (Refer to Figure 51-6).
j. After repair is complete, sand to obtain a good surface finish.

4. Cracks: (Refer to Figure 51-7)

a. Before repairing a crack in thermoplastic parts, first determine what caused crack and alleviate condition to prevent it from recurring.
b. Drill small stop holes at each end of crack.
c. If possible, bond a double plate to reverse side of crack to provide extra strength.
d. The crack should be V grooved and filled with repair material such as solvent cement, hot melt adhesive, epoxy patching compound, or hot air weld.
e. After repair has cured, sand to match surrounding finish.

5. Repairing Major Damage: (Larger than 1 inch in diameter.) (Refer to Figure 51-8.)

a. Make a patch of same material and cut slightly larger than section being repaired.
b. When appearances are important, large holes, cracks, tears, etc., are repaired by cutting out damaged area and replacing with a piece of similar material.
c. When cutting away damaged area, under cut perimeter and maintain a smooth edge. The patch or plug should also have a smooth edge to ensure a good fit.
d. Coat patch with solvent adhesive and firmly attach it over damaged area.
e. Let the patch dry for approximately 1 hour before any additional work is performed.
f. Fill hole, etc. with repair material. A slight overfilling of repair material is suggested to allow for sanding and finishing after repair has cured. If patching compound is used, repair should be made in layers, not exceeding a 1/2 inch in thickness at a time. Allow compound to cure and ensuring a good buildup of successive layers.

6. Stress lines: (Refer to Figure 51-9)

a. Stress lines produce a whitened appearance in a localized area. They are generally caused by severe bending or impacting of material. (Refer to Figure 51-10.)
b. To restore material to original condition and color, use a hot air gun or similar heating device to apply heat to affected area. Do not overheat material.

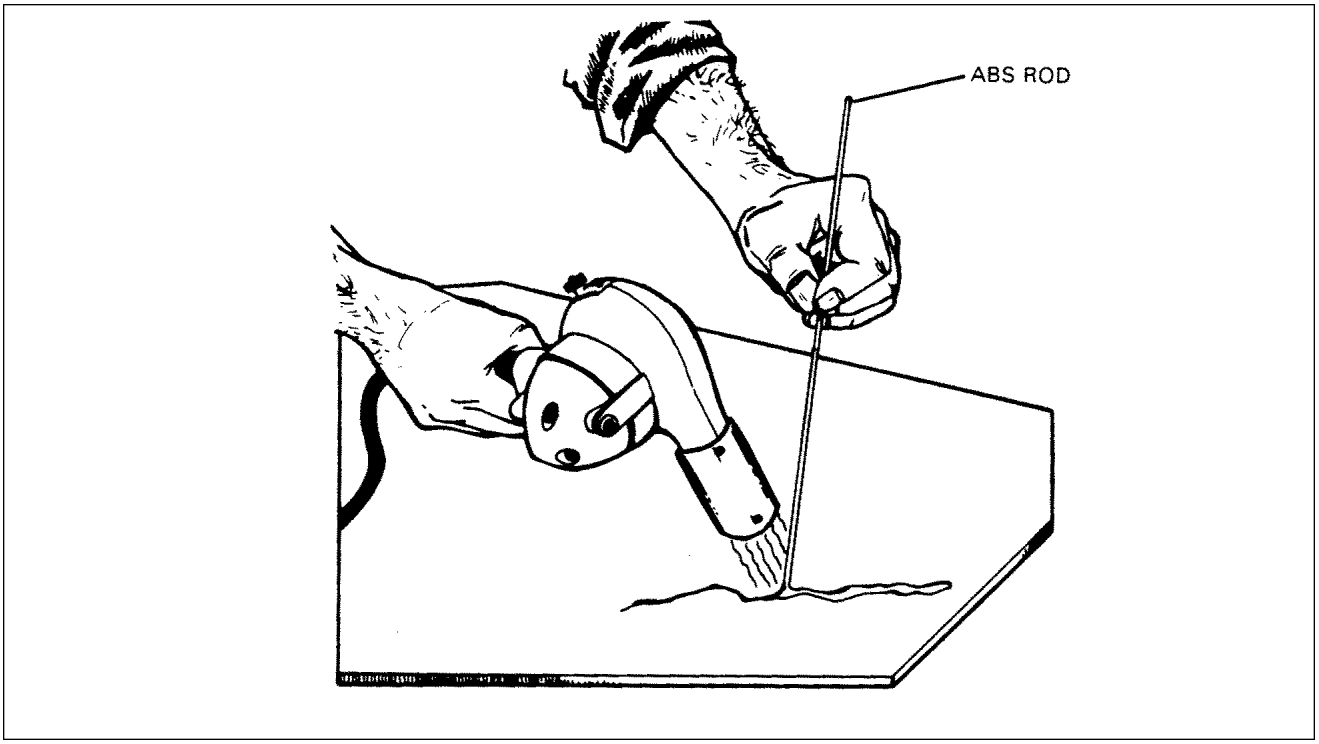


Figure 51-6. Welding Repair Method

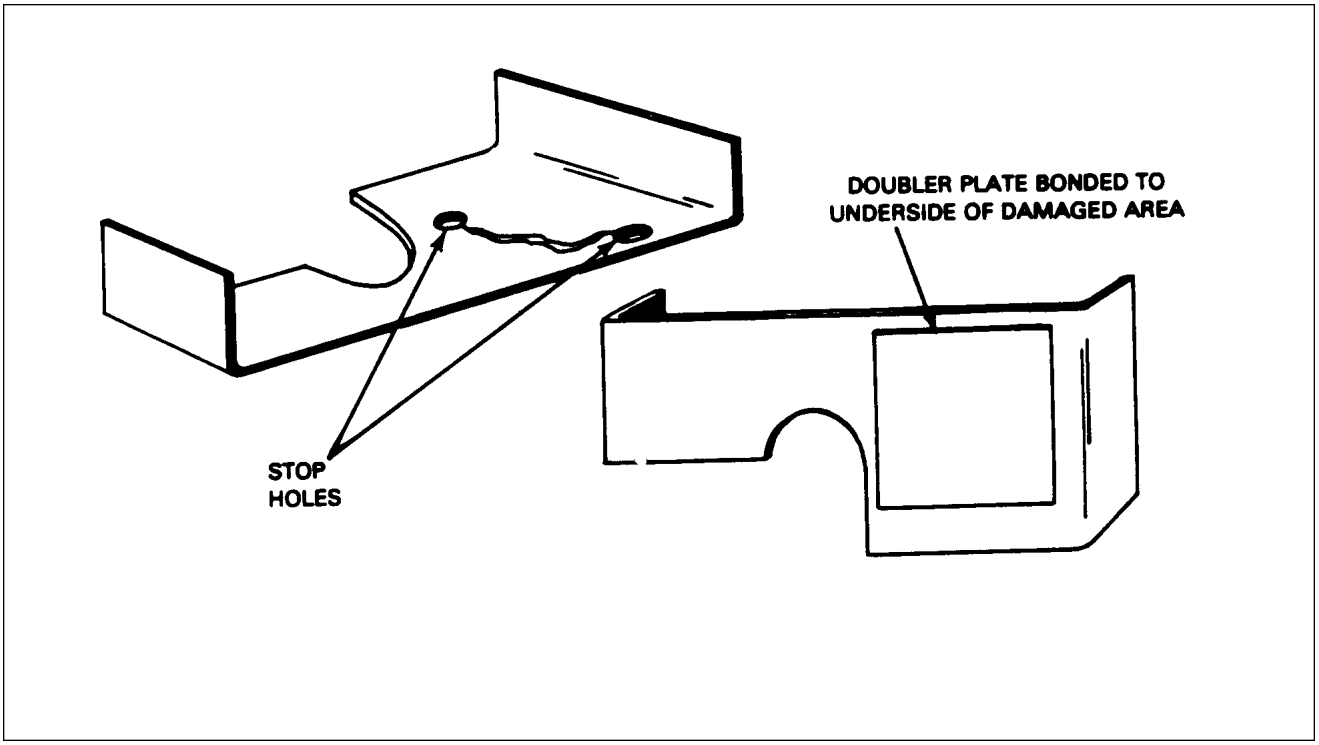


Figure 51-7. Repairing of Cracks

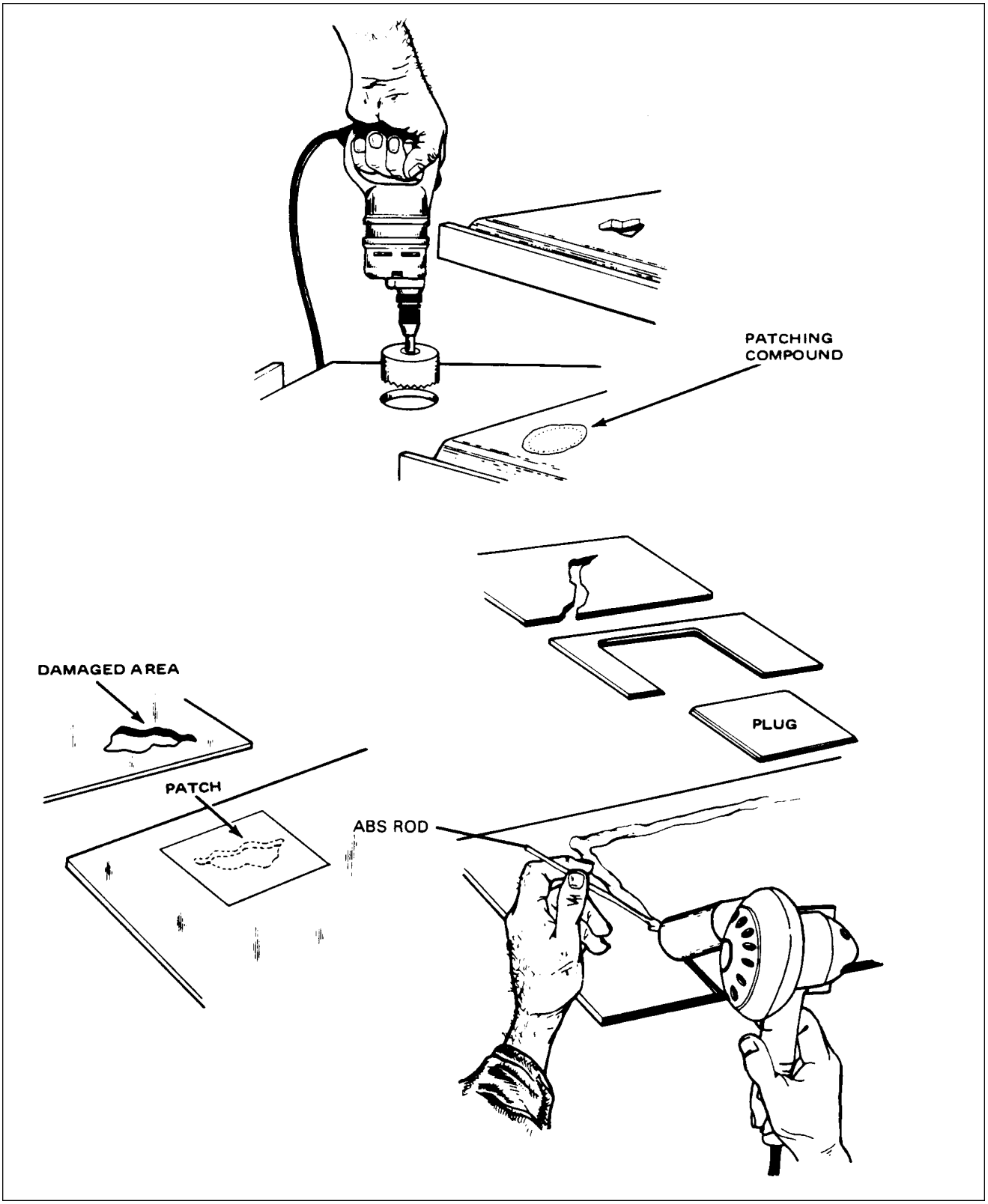


Figure 51-8. Various Repairs

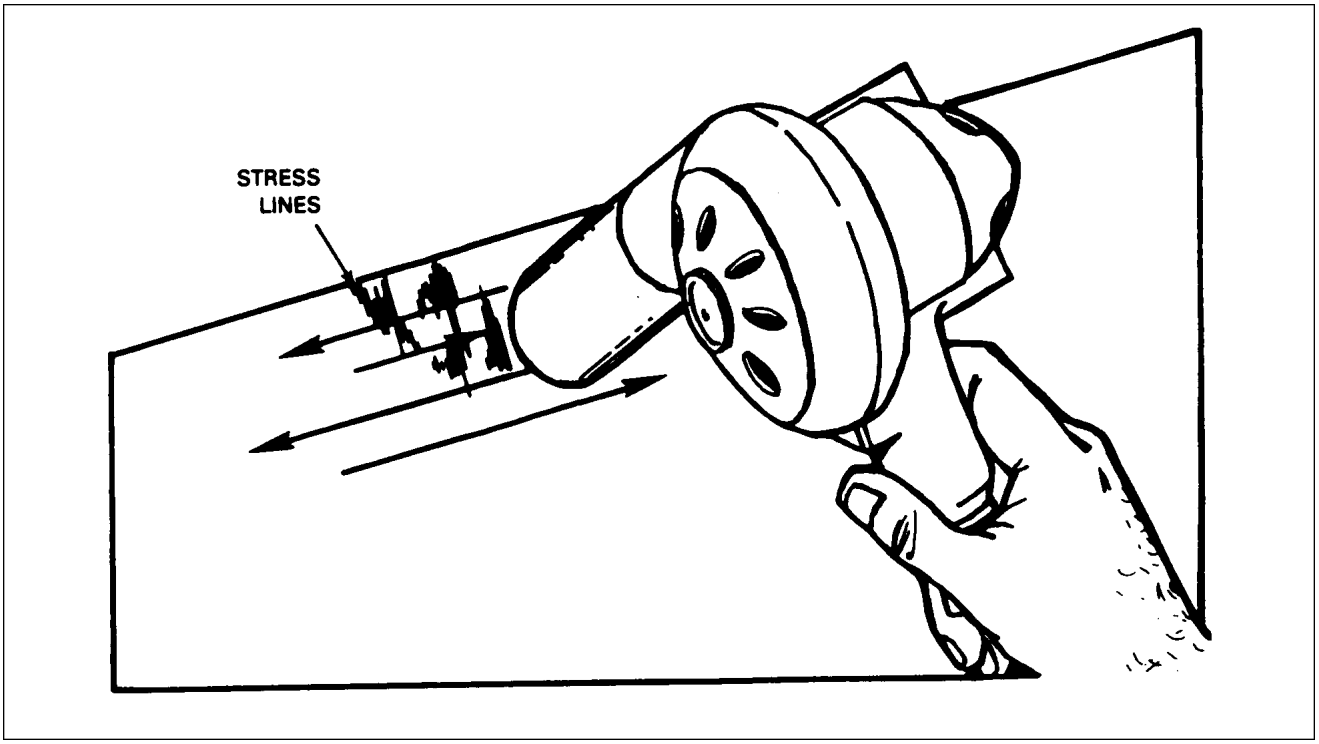


Figure 51-9. Repair of Stress Lines

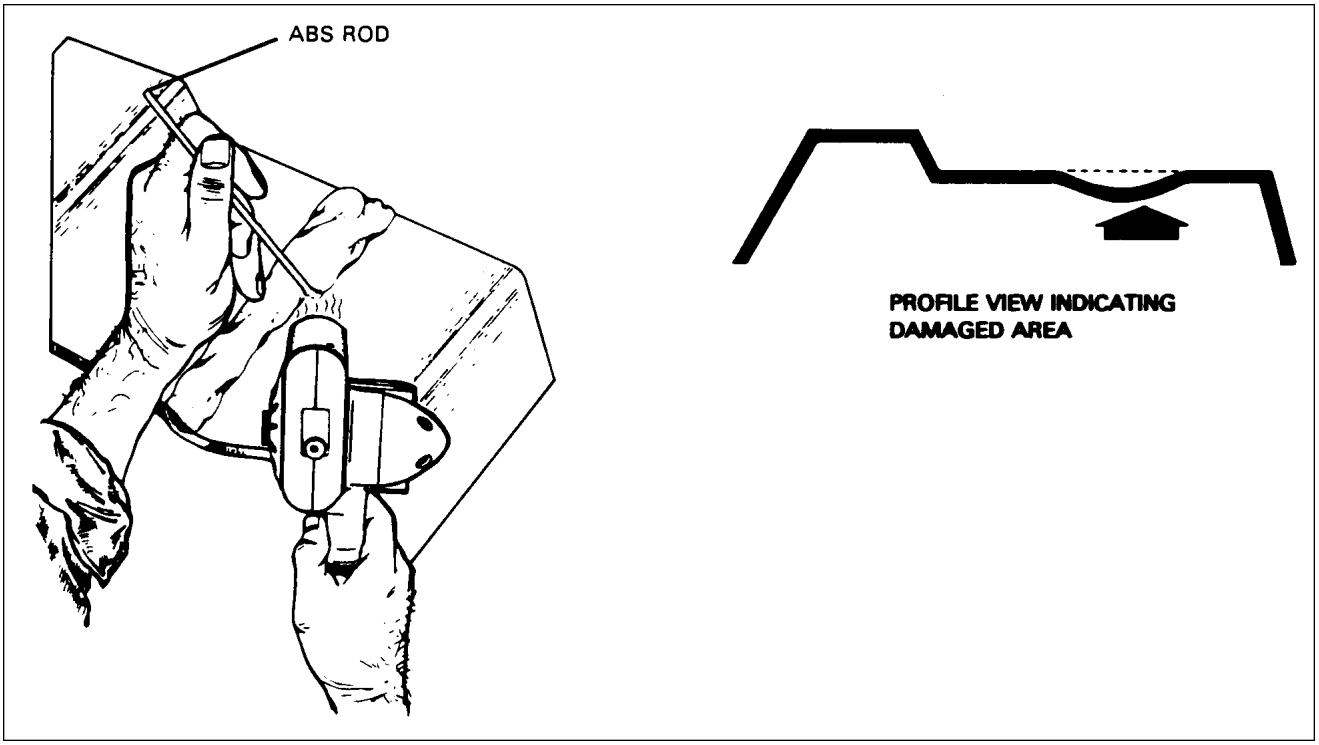


Figure 51-10. Repair of Impacted Damage

7. Painting the Repair:

—CAUTION—

Not all lacquers or enamels can be used on thermoplastics. Some paint solvents will affect and degrade the plastic properties.

—CAUTION—

Do not use hard, brittle coatings in flexing, impact, or high stress areas. Such coating may crack, creating a weak area.

a. An important factor in obtaining a quality paint finish is the proper preparation of the repair and surrounding area before applying any paint.
b. Clean parts before painting with a commercial cleaner or a solution made from 1/4 cup of detergent mixed with one gallon of water.
c. Use lacquer or enamel paint for thermoplastic repair.
Do not use hard, brittle coatings in flexing, impact, or high stress areas. Such coating may crack, creating a weak area.

D. A.B.S. THERMOPLASTIC LANDING GEAR WHEEL AND STRUT FAIRING REPAIR INSTRUCTIONS.

Instructions for wheel and strut fairings are in a special instruction manual available from Piper. Refer to vendor publication list on grid 1A3 for part number and order information.

E. SAFETY WALK REPAIR

1. Surface Preparation

a. Clean all surfaces with a suitable cleaning solvent to remove dirt, grease, and oils. Apply solvents by dipping, spraying, or mopping.
b Check no moisture remains. Wipe surface with a clean dry cloth.
c. Outline the area to which liquid safety walk compound is to be applied, and mask adjacent surfaces.

—NOTE—

For newly painted surfaces, allow 2.5 hours minimum drying time before application of safety walk.

2. Product Listing For Liquid Safety Walk Compound

a. Suggested Solvents: Safety Solvent per MIL-S-18718 Sherwin Williams Lacquer Thinner R7KC120 Glidden Thinner No. 207
b. Safety Walk Material:
Walkway Compound and Matting Nonslip (included in Piper Part No. 179 872)

3. Application of Liquid Safety Walk Compound

— NOTE —

Apply in an area which is free of moisture for a period of 24 hours minimum after application.

— NOTE —

Do not apply when surface to be coated is below 50°F

— NOTE —

Do not walk on coated surface for a minimum of six hours after final coating.

a. Mix and thin liquid safety walk compound per manufacturer's instructions on container.
b. Coat surfaces with a smooth, unbroken film of liquid safety walk compound. A nap type roller or a stiff bristle brush is recommended, using fore and aft strokes.
c. Allow coating to dry for 15 minutes to 1 hour before recoating or touch-up, if required, after the initial coating.
d. After coating or touch-up, allow coating to dry for 15 minutes to 1 hour before removing masking.

4. Surface Preparation For Pressure Sensitive Safety Walk

a. Remove all contaminates and moisture.
b. Mask off area to protect painted surfaces.
c. Apply suitable stripper MEK Federal Spec. TT-M-261, U.S.Rubber No. 3339 to wingwalk compound. As compound softens, remove with putty knife or other suitable tool.
d. Prime and paint area.

— NOTE —

For newly painted surfaces allow 2.5 hours minimum drying time before application of safety walk.

5. Application Of Pressure Sensitive Safety Walk

— NOTE —

Do not apply when surface to be coated is below 50°F.

a. Peel back full width of protective liner approximately 2 inches from leading edge of safety walk.
b. Beginning at leading edge, apply safety walk to wing area. Verify proper alignment and position from wing flap.
c. Remove remaining protective liner as safety walk is being applied.
d. Roll firmly with a long handled cylindrical brush in both lengthwise directions. Verify all edges adhere to wing skin.
e. Install and rivet leading edge retainer.

GRIDS 2K16 AND 2K17
INTENTIONALLY LEFT BLANK

CHAPTER

52

DOORS

2K18

Island Enterprises

CHAPTER 52 - DOORS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
52-00-00	GENERAL	2K21	
52-10-00	PASSENGER / CREW	2K23	
52-10-00	Cabin Door	2K23	
52-10-00	Removal of Door	2K23	
52-10-00	Installation of Door	2K23	
52-10-00	Adjustment of Door	2K23	
52-10-00	Door Latch Mechanism	2K23	
52-10-00	Removal of Door Latch Mechanism	2K23	
52-10-00	Installation of Door Latch Mechanism	2K23	
52-10-00	Adjustment of Door Latch Mechanism	2K23	
52-10-00	Door Lock Assembly	2K23	
52-10-00	Removal of Door Lock Assembly	2K23	
52-10-00	Installation of Door Lock Assembly	2K24	
52-10-00	Door Safety Latch	2K24	
52-10-00	Removal of Door Safety Latch	2K24	
52-10-00	Installation of Door Safety Latch	2K24	
52-10-00	Adjustment of Door Safety Latch	2K24	
52-10-00	Removal and lnstallation of Door Snubber	2K24	
52-30-00	CARGO	2L4	
52-30-00	Baggage Door	2L4	
52-30-00	Removal of Baggage Door	2L4	
52-30-00	Installation of Baggage Door	2L4	
52-30-00	Baggage Door Lock Assembly	2L4	
52-30-00	Removal of Baggage Door Lock Assembly	2L4	
52-30-00	Installation of Baggage Door Lock Assembly	2L4	
52-30-00	Baggage Door Hinge	2L4	
52-30-00	Removal of Baggage Door Hinge	2L4	
52-30-00	Installation of Baggage Door Hinge	2L4	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

This chapter gives information on service and replacement procedures of the cabin and baggage doors.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

PASSENGER/CREW

A. CABIN DOOR

This airplane has one entrance door on the right side of the fuselage.

1. Removal Of Door

a. Remove clevis bolt, washer and bushing from door holder assembly.
b. Remove cotter pins, clevis pins, and washers from serrated door hinges.
c. Remove door from airplane.

2. Installation Of Door

a. Insert door into position and install washers, clevis bolts, and cotter pins on door hinges.
b. For door adjustment refer to adjustment of door.
c. Hook up and install clevis bolt, bushing, and washer into door holder assembly.

3. Adjustment Of Door

a. For proper vertical adjustment of door, insert the necessary washer combination between cabin door hinge and fuselage bracket assembly.
b. Make additional adjustments by tapping out serrated door hinge bushings and rotating them to find hinge centerline for proper door fit.
c. To improve sealing, lubricate door seals with any non-fluorocarbon or similar dry lubricant spray, or wipe with MIL-H-5606 lubricant, as needed, .

B. DOOR LATCH MECHANISM

1. Removal Of Door Latch Mechanism

a. Remove door latch mechanism by removing door trim upholstery and the screws holding latch plate and latch mechanism to door.
b. Disconnect latch pull rod from the inside door handle.
c. Remove complete latch mechanism.

2. Installation Of Door Latch Mechanism

a. Place latch assembly into position on door.
b. Connect latch pull rod to inside door handle.
c. Replace screws holding latch plate and mechanism to door. Install door trim upholstery and secure with screws.

3. Adjustment Of Door Latch Mechanism

a. Loosen screws on striker plate.
b. Adjust and tighten screws.

C. DOOR LOCK ASSEMBLY

1. Removal Of Door Lock Assembly

a. Remove door trim upholstery by removing attachment screws.
b. Loosen nut on lock assembly and remove lock by turning it sideways.

2. Installation Of Door Lock Assembly

a. Install lock in door by turning it sideways and placing it through the opening.
b. Replace nut on back of lock assembly and tighten.
c. Replace door trim upholstery and secure with attachment screws.

D. DOOR SAFETY LATCH

1. Removal Of Door Safety Latch

a. Remove the two handles and five screws holding pan inside the door.
b. Remove pan and pull latch assembly through opening on door.

2. Installation Of Door Safety Latch

a. Place latch assembly into position for installation.
b. Replace pan and install the five screws and handles.
c. Check latch assembly for operation and verify it is not rubbing panels.

3. Adjustment Of Door Safety Latch

a. Remove two screws from latch plate at top of door opening.
b. Remove plate and turn loop assembly in or out for adjustment.
c. Replace latch plate and secure with two attachment screws.

E. REMOVAL AND INSTALLATION OF DOOR SNUBBER. (Refer to Figure 52-1)

The neoprene rubber door snubber is incorporated in the cabin door jamb to improve door sealing. Installation on aircraft not equipped with the snubber is per **Field Service Kit For Improved Door Sealing, Kit No. 763 962.**

— CAUTION —

Replace existing seal if torn or deteriorated Bond the seal if loose or marginal, using one of the following adhesives:
1. 3MEC1300L (preferred)
2. Scotchgrip 2210
3. Proco #6205-1
Refer to the consumable materials list for vendor information.

1. Remove snubber as follows:
   a. Back off windlace retaining trim screws, roll windlace back out of the way, and tape it there. Remove sill scuff plate and door holder.
   b. Apply mineral spirits to snubber to loosen adhesive. Use plastic scraper or appropriate instrument, and scrape off snubber while applying mineral spirits to dissolve adhesive.
   c. With snubber removed, use a clean cloth and mineral spirits to remove all excess adhesive.
2. If door jamb is flaking or excessively scuffed, do as follows:
   a. Rub down and feather finish with wet or dry emery cloth. Go over the surface with fine (400 grit) paper.
   b. Wipe surface with Prep-Sol or similar cleaner which will not leave an oily residue.
   c. Prime, sand (400 grit), and paint. Allow paint to dry thoroughly before proceeding.

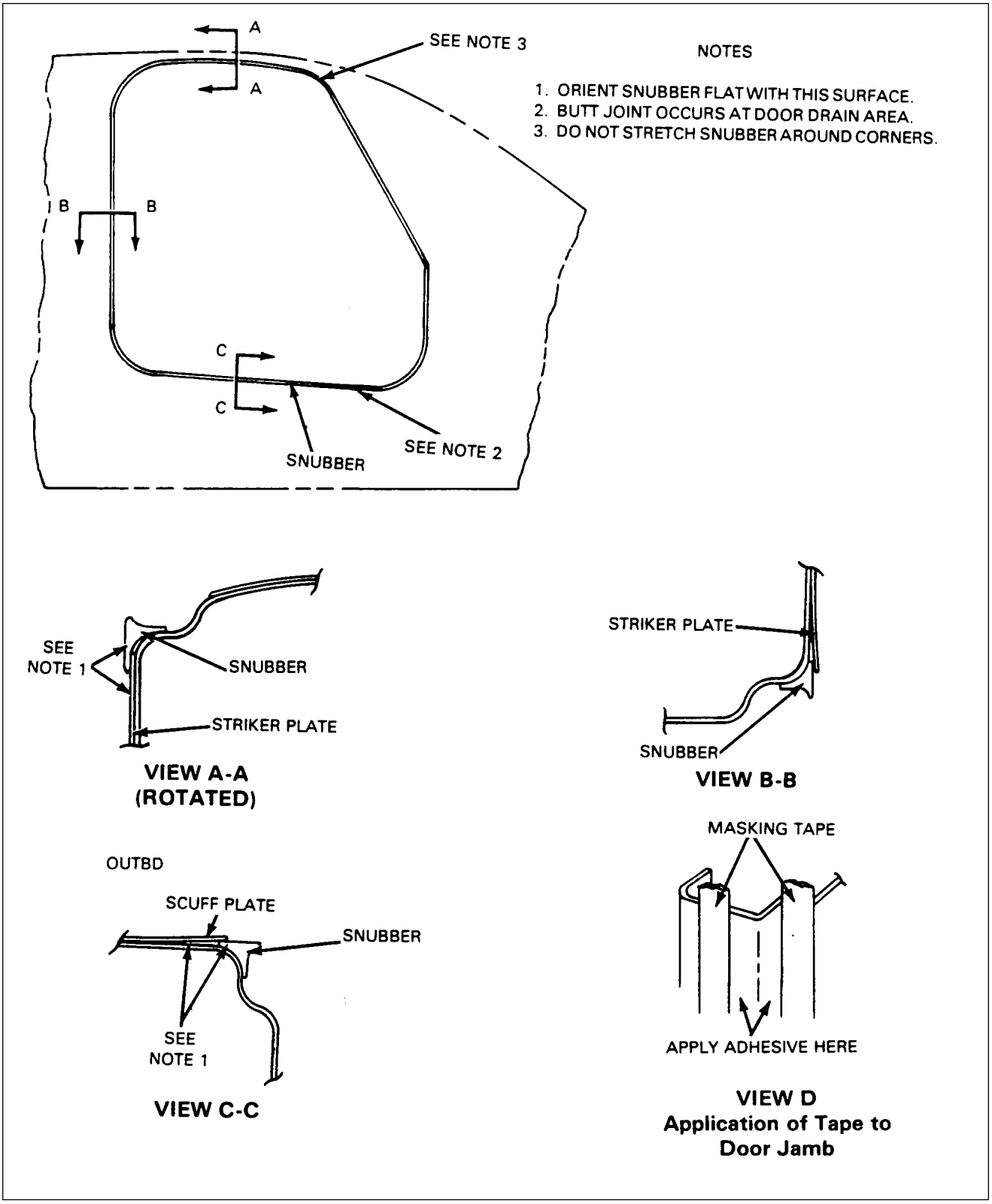


Figure 52-1. Installation of Door Snubber

3. Install door snubber as follows:

— CAUTION —

Do not pre-stretch snubber as this will cause cracks in the snubber.

— CAUTION —

Check windlace is rolled back and taped to completely expose door jamb and prevent sealant from adhering to windlace.

a. Clean door jamb using “Prep-Sol” or a similar cleaner which will not leave an oily residue.

— NOTE —

Normal “tack-time” for EC1300L is 30-45 minutes (less in a warm area). Install snubber before adhesive tack time so snub - ber may be manipulated into correct position. If adhesive sets before snubber installation, reactivate by using a clean rag moistened with Toluol or M.E.K.

For a clean installation. mask jamb as shown in Figure 52- 1.

— CAUTION —

Verify snubber leg goes under striker plate for side latch and over striker plate for upper latch. (Refer to figure 52-1.)

b. Apply adhesive to door jamb as shown in Figure 52-1, view D, and to the inside surface of snubber.
c. Begin at door drain hole area, and work clockwise around jamb. Position snubber with protruding leg facing outboard. Apply pressure to snubber to remove entrapped air and check for an effective bond.
d. Allow adhesive to cure at least 24 hours with door open. Open door as long as possible for a maximum cure.
e. Check for proper cure by peeling back a small local area of the snubber legs.
f. When adhesive has cured, clean any adhesive smears with a clean cloth and mineral spirits or Toluol. Remove masking tape and install windlace, sill scuff plate, and door holder.
g. To compensate for the added snubber, adjust door latches for a flush door to fuselage fit.
h. Coat snubber with silicone after all adjustments and curing.

THIS PAGE INTENTIONALLY LEFT BLANK

CARGO

A. BAGGAGE DOOR

The baggage door is on the right side of the fuselage of wing trailing edge.

1. Removal Of Baggage Door

With door open, remove hinge pin from hinge and remove door.

2. Installstion Of Baggage Door

Place door so hinge halves are properly matched and install hinge pin. It is not necessary to replace hinge pin with a new pin if it is not bent or worn.

B. BAGGAGE DOOR LOCK ASSEMBLY

1. Removal Of Baggage Door Lock Assembly

a. With door open remove nut from back of lock assembly with a special made wrench. (The tool may be fabricated per dimensions in Figure 52-2.)
b. Remove lock assembly through the front of the door.

2. Installation Of Baggage Door Lock Assembly

a. Place lock into position for installation.
b. Install nut on lock assembly and tighten with special wrench.

C. BAGGAGE DOOR HINGE

1. Removal Of Baggage Door Hinge

a. Remove door from airplane as per removal of baggage door.
b. Remove hinge half from airplane or door by drilling out the rivets and removing hinge.

2. Installation Of Baggage Door Hinge

a. Place hinge halves together and install hinge pin.
b. Install door in the closed position and drill the two end rivet holes. Install the rivets.
c. Operate door and check proper fit and installation. Drill remaining holes and install rivets.

THIS SPACE INTENTIONALLY LEFT BLANK

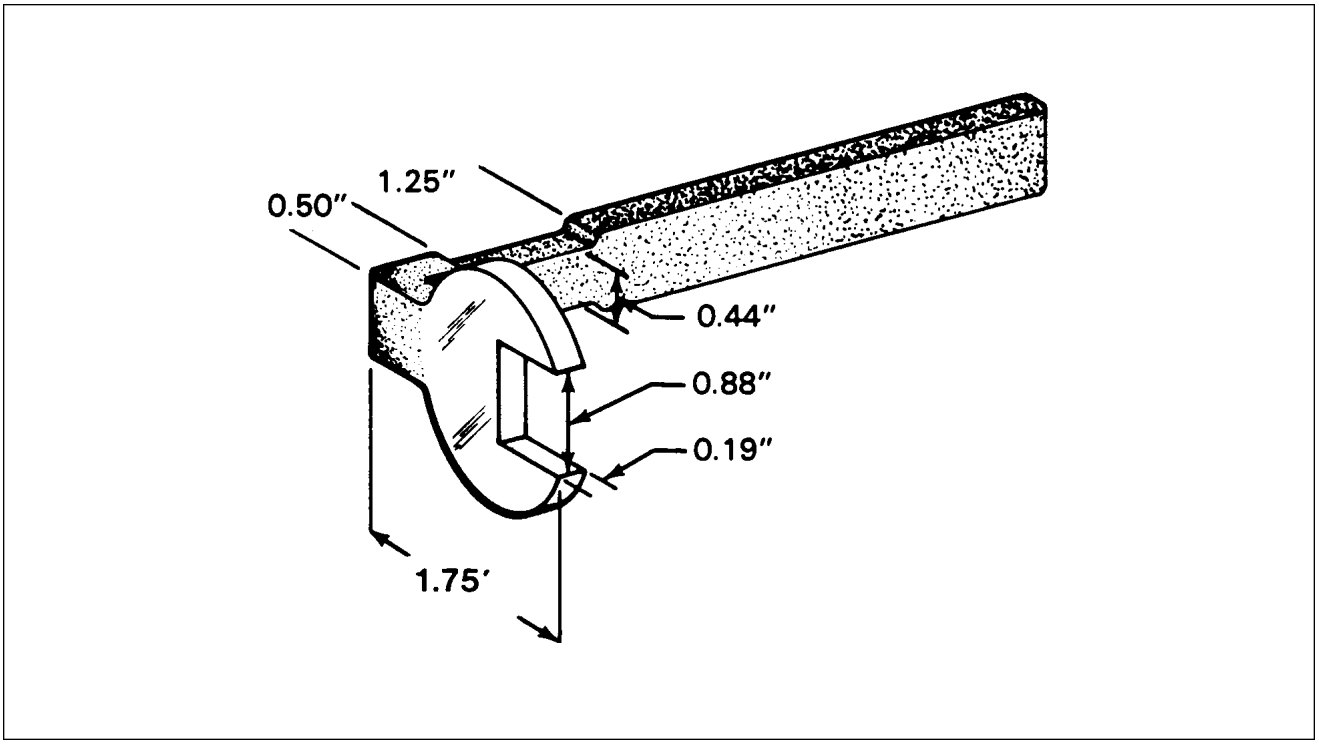


Figure 52-2. Fabricated Tool for Baggage Door Lock

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

55

STABILIZERS

2L7

CHAPTER 55 - STABILIZERS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
55-00-00	GENERAL	2L9	
55-20-00	STABILATOR AND TAB	2L10	
55-20-00	Removal of Stabilator	2L10	
55-20-00	Installation of Stabilator	2L10	
55-20-00	Stabilator Trim Tab	2L11	
55-20-00	Removal of Stabilator Trim Tab	2L11	
55-20-00	Installation of Stabilator Trim Tab	2L11	
55-20-00	Checking Stabilator Surfaces Free Play	2L11	
55-20-00	Balancing	2L15	
55-20-00	Balancing Equipment	2L15	
55-20-00	Balancing Stabilator	2L15	
55-30-00	VERTICAL STABILIZER	2L17	
55-30-00	Removal of Vertical Fin	2L17	
55-30-00	Installation of Vertical Fin	2L17	
55-40-00	RUDDER AND TAB	2L19	
55-40-00	Removal of Rudder	2L19	
55-40-00	Installation of Rudder	2L19	
55-40-00	Balancing Rudder	2L19	

GENERAL

This chapter gives information on service and replacement procedures of the stabilizers, and related control surfaces and tabs.

THIS SPACE INTENTIONALLY LEFT BLANK

STABILATOR AND TAB

A. REMOVAL OF STABILATOR (Refer to Figure 55-1.)

— CAUTION —

Before entering the aft portion of fuselage, attach a stand to the tail skid for support. Use a heavy pad to protect the inside of the fuselage. Distribute weight on top of the bulkheads to avoid damage to the fuselage skin.

— CAUTION —

Use rudder pedals or tow bar to move rudder to extreme left or right for clearance.

1. Remove screws from around upper and lower tail cone fairing assembly and remove fairing separately.
2. Block trim cable at barrel of trim screw assembly to prevent cable from unwrapping.
3. Remove access panel to the aft section of fuselage at the back wall of the baggage compartment.
4. Install cable blocks, per figure 55-2, on the stabilator trim control cable at the first set of pulleys forward of the cable turnbuckles to prevent the forward cable from unwrapping.
5. Disconnect trim cables at turnbuckles within the aft section of fuselage.
6. Relieve tension from stabilator control cables by loosening one of the cable turnbuckles in the aft section of fuselage.
7. Disconnect stabilator control cables from stabilator balance arm by removing cotter pins, nuts, washers, bushings, and clevis bolts.
8. Disconnect tab control arm connecting links from trim screw by removing nut, washers, bushings and bolts.
9. Disconnect trim assembly from the aft bulkhead of fuselage by removing attaching nuts, washers, and bolts of the horizontal and diagonal support brackets.
10. Move trim assembly up through tail cone fairing cutout in stabilator and remove, with cable, from airplane.
11. Remove stabilator by disconnecting it at its hinge points. Remove attaching nuts, washers, and bolts.

B. INSTALLATION OF STABILATOR (Refer to Figure 55-1.)

— CAUTION —

A clearance of 0.25 ± 0.06 inch between stabilator and the side of fuselage and 0.18 inch minimum between all parts of stabi - lator and tail cone assembly must be maintained throughout stabilator travel. Use a proper washer combination on stabila - tor hinges for necessary tolerances.

1. Insert stabilator in position and install attaching hinge bolts, washers, and nuts.
2. Move trim assembly through the cutout in stabilator and attach assembly brackets to the aft bulkhead with bolts, washers, and nuts. Insert trim cable ends into fuselage.
3. Attach stabilator control cables to stabilator balance arm with clevis bolts. bushings, washers, nuts and cotter pins.

4. Connect the ends of the fore and aft trim cables at the turnbuckles within the aft section of fuselage.
5. Remove cable block from trim control cable within fuselage.
6. Set stabilator control cable tension and check rigging and adjustment per Rigging and Adjustment of Stabilator, Chapter 27.
7. Remove cable blocks from trim cable at barrel of trim screw assembly.
8. Set stabilator trim control cable tension and check rigging and adjustment per instructions in chapter 27. Connect tab control arm to trim screw (with the control arm connecting links) with bolt, bushings, washers, and nut. Check tab attachment bolt head is on the side next to trim indicator cable to ensure no interference with indicator cable.
9. Remove pad from the aft section of fuselage and replace access panel.
10. Install tail cone fairing and remove tail stand.

C. STABILATOR TRIM TAB

1. Removal Of Stabilator Trim Tab (Refer to figure 55-1.)

a. Disconnect stabilator trim control rod by removing bolts that attach control rod to stabilator trim tab.
b. Remove stabilator trim hinge pins by cutting one end of the wire pins.
c. Remove stabilator trim tab.

2. Installation Of Stabilator Trim Tab (Refer to figure 55-1.)

a. Place trim tab in position on the aft end of stabilator.
b. Insert new pins and secure by bending end to a 45 degree angle.
c. Install control rod and attach with the four bolts and washers.

D. CHECKING STABILATOR SURFACES FREE PLAY

Do the following checks before balancing to verify free play in stabilator and stabilator trim tab:

1. Stabilator: Check for any free play at its attachment points by grasping each half near the tip and gently trying to move it up and down, fore and aft, and in and out. No play is allowed.
2. Stabilator Trim Tab: Set stabilator trim tab in neutral position. Neutral position is determined with airplane properly rigged per chapter 27 instructions and trim indicator in neutral position. Use a straightedge long enough to extend from the ground to a few inches above trim tab trailing edge. Place straightedge next to trim tab inboard (center) trailing edge, secure stabilator in neutral and grasping tab, gently move it up and down. Mark the limit of tab free play on straightedge. Overall travel (free play) must not exceed 0.15 inch. Use a dial indicator and fixed stand

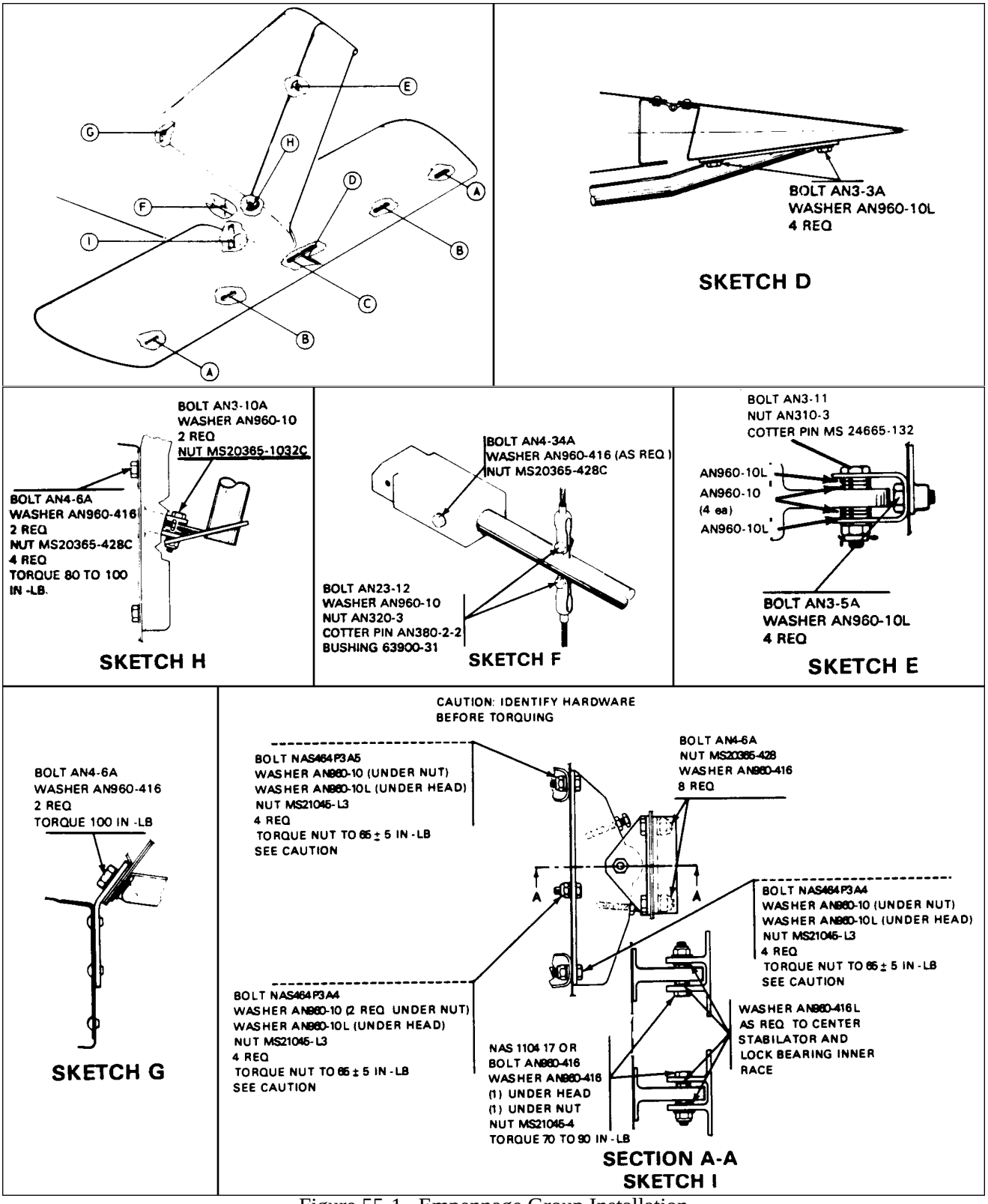


Figure 55-1. Empennage Group Installation

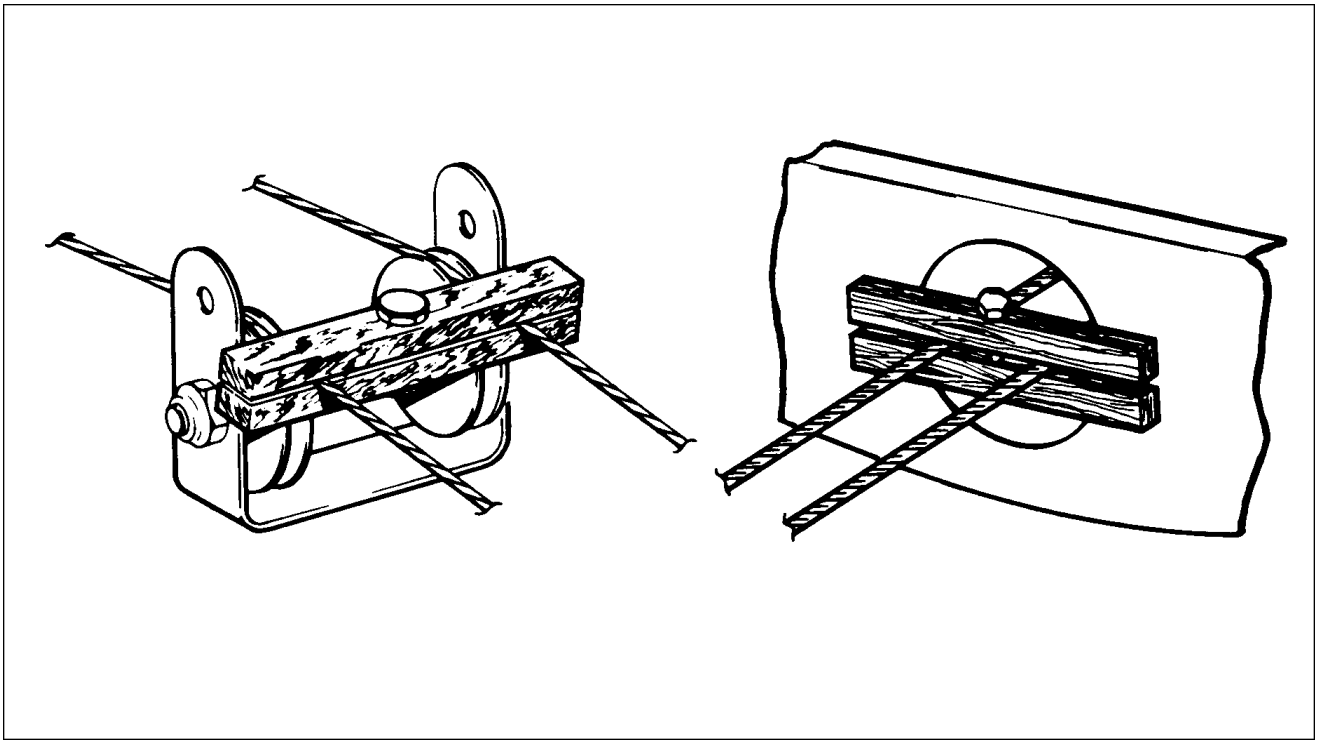


Figure 55-2. Methods of Securing Control Cables

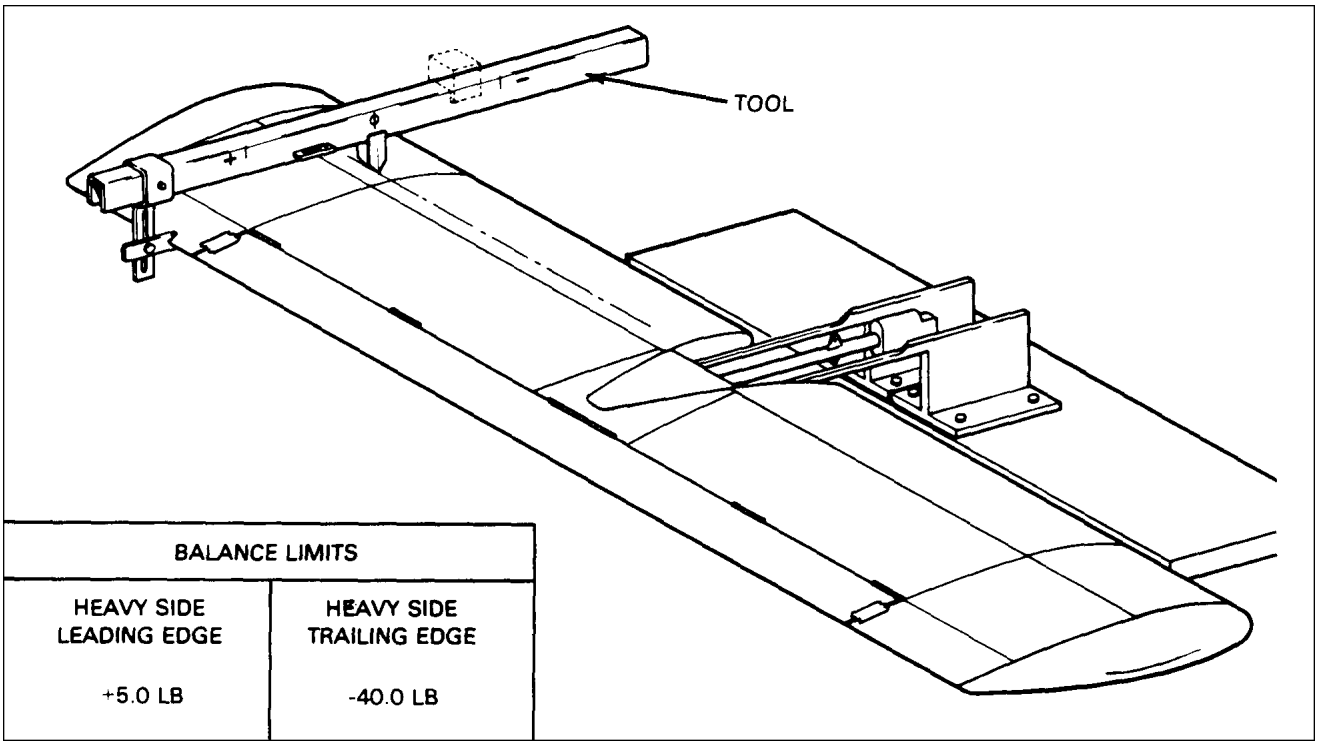


Figure 55-3. Stabilizer Balance

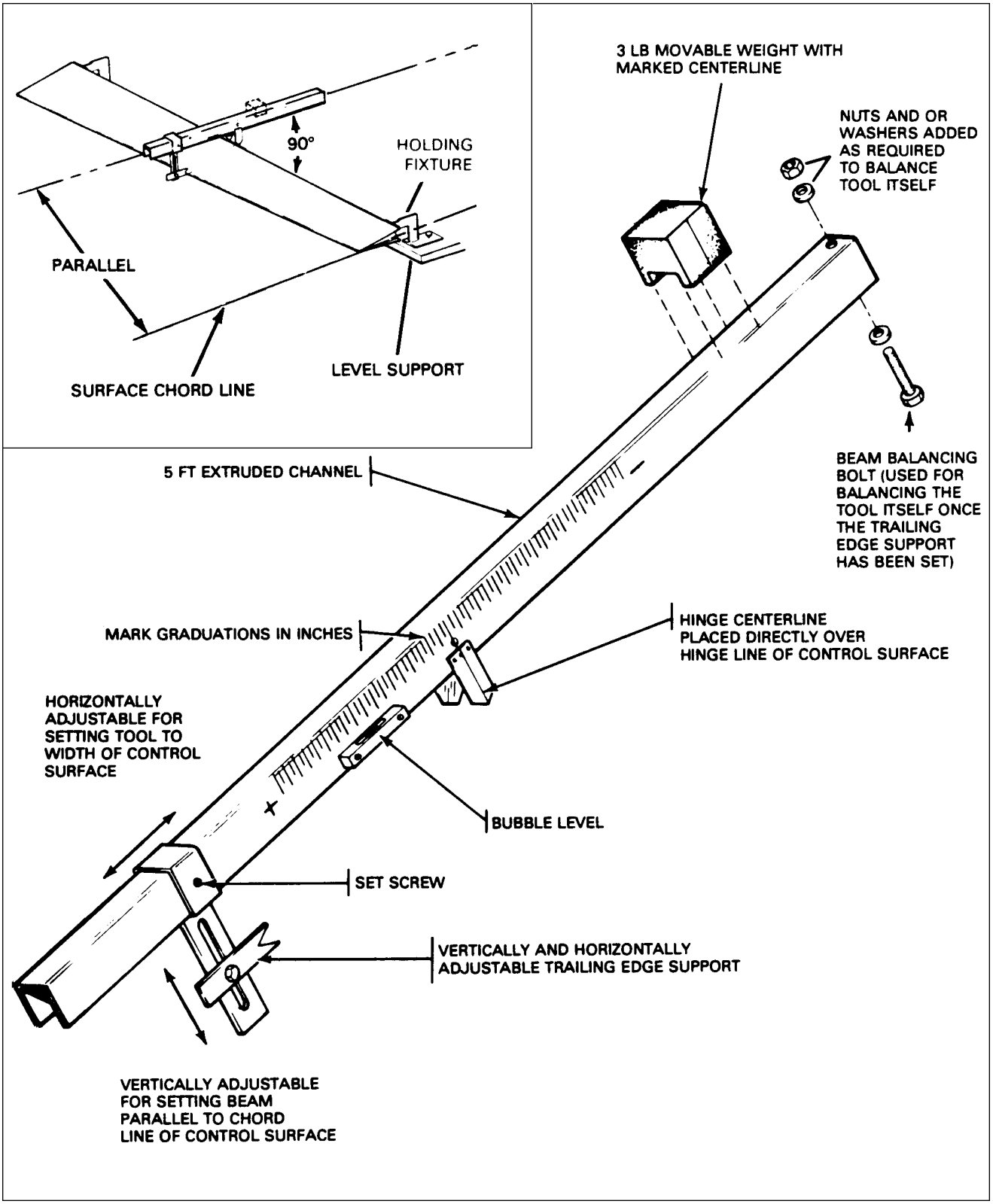

90°
HOLDING FIXTURE
PARALLEL
SURFACE CHORD LINE
LEVEL SUPPORT
3 LB MOVABLE WEIGHT WITH MARKED CENTERLINE
NUTS AND OR WASHERS ADDED AS REQUIRED TO BALANCE TOOL ITSELF
BEAM BALANCING BOLT (USED FOR BALANCING THE TOOL ITSELF ONCE THE TRAILING EDGE SUPPORT HAS BEEN SET)
5 FT EXTRUDED CHANNEL
MARK GRADUATIONS IN INCHES
HINGE CENTERLINE PLACED DIRECTLY OVER HINGE LINE OF CONTROL SURFACE
HORIZONTALLY ADJUSTABLE FOR SETTING TOOL TO WIDTH OF CONTROL SURFACE
BUBBLE LEVEL
SET SCREW
VERTICALLY AND HORIZONTALLY ADJUSTABLE TRAILING EDGE SUPPORT
VERTICALLY ADJUSTABLE FOR SETTING BEAM PARALLEL TO CHORD LINE OF CONTROL SURFACE

Figure 55-4. Control Surface Balancing Tool

E. BALANCING

1. Balancing Equipment

Balancing must be done using a suitable tool capable of measuring unbalance in inch-pounds from the centerline of the control surface hinge pin. See the tool configuration in Figure 55-4. Other tool configurations may be used if accuracy is maintained and recalibration capability is provided. The tool shown in Figure 55-4 may be calibrated by placing it on the control surface to be balanced with the balance points over the control surface hinge centerline and balance bar parallel to cord line. Position trailing edge support to align tool with the control surface cord line and secure in this position. Remove tool without disturbing trailing edge support. Balance tool by adding weight to the light end as required. (The movable weight must be at the centerline.) Place tool on the control surface perpendicular to hinge centerline per Figures 55-3 and 55-5. Read scale when bubble level has been centered by adjustment of the movable weight.

2. Balancing Stabilator (Refer to Figure 55-3.)

To balance stabilator, assembly must be complete including trim tab, the tab push rod and end bearing, stabilator tips, and all attaching screws. Before balancing, tape trim tab in neutral position with a small piece of tape. Place complete assembly on knife edge supports in a draft free area allowing unrestricted movement. Place tool on stabilator with beam perpendicular to hinge centerline. Do not place tool on trim tab. Calibrate tool per balancing equipment. Read scale when bubble level has been centered by adjustment of the movable weight and determine static balance limit. If static balance is not per limits in Figure 55-3, proceed as follows:

a. If stabilator is out of limits on leading edge heavy side, remove balance plates from mass balance weight until static balance is within limits. Do not adjust stabilator tip balance weight.
b. If stabilator is out of limits on trailing edge heavy side, add balance plates to mass balance weight until static balance is within limits.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

VERTICAL STABILIZER

A. REMOVAL OF VERTICAL FIN

1. Remove screws from upper and lower tail cone fairing, fin tip cover, and fairing at forward base of fin.
2. Remove rudder per instructions in removal of rudder.
3. Disconnect leads from antenna terminals (optional) and attach a line to leads to aid installation.
4. Disconnect wire antenna (optional) that attaches to leading edge of fin.
5. Disconnect positive lead to rotating beacon (optional) and attach a line prior to removal. Disconnect ground lead by removing attaching screw.
6. Remove stabilator trim assembly and aft trim cable per Chapter 27, Removal of Stabilator Trim Assembly (Aft).
7. Remove bolt and washer attaching leading edge of fin to fuselage.
8. Remove nuts. washers, and bolts holding fin spar to the aft bulkhead, and remove vertical fin.

B. INSTALLATION OF VERTICAL FLN

1. Insert vertical fin into position and install bolts, washers, and nuts holding fin spar to the aft bulkhead.
2. Install bolt and washer attaching leading edge of fin to fuselage.
3. Install stabilator trim assembly and aft trim cable per Chapter 27, lnstallation of Stabilator Trim Assembly.
4. Install rudder per installation of rudder.
5. Pull electrical and antenna leads through vertical fin with the line that was attached.
6. Connect antenna leads to proper terminals and secure with washers and nuts.
7. Connect electrical leads at the disconnects and insulate.
8. Rig and adjust rudder and trim control cables per Chapter 27.
9. Check operation of radios and electrical lights.
10. Replace all fairings and access plates, and secure with attaching screws.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

RUDDER AND TAB

A. REMOVAL OF RUDDER

1. Remove screws from around upper tail cone fairing assembly and remove fairing.
2. Remove rudder tip by removing attaching screws and disconnect tail position light wire at the quick disconnect at tip of rudder. Open access panel in rear of baggage compartment to access the aft section of fuselage.
3. Relieve cable tension from rudder control system by loosening one of the cable turnbuckles in the aft section of fuselage.
4. Disconnect two control cables from rudder horn by removing cotter pins, nuts, washers, bushings, and bolts.
5. Remove cotter pins, nuts, washers, and bolts from upper and lower rudder hinge pivot points.
6. Pull rudder up and aft from vertical fin.

B. INSTALLATION OF RUDDER. (Refer to Figure 55-1.)

1. Place rudder in position and install hinge bolts, washers, nuts, and cotter pins.

— NOTE —

Use any washer combination of hinge assembly for best centering and operation of rudder.

2. Connect tail position light electrical lead at the quick disconnect and cover the connector with an insulating sleeve. Tie both ends of sleeve with number six electrical lacing twine.
3. Connect control cables to rudder horn with bolts, washers, nuts, and cotter pins.
4. Check rudder per Rigging and Adjustment of Rudder, chapter 27.
5. Install upper tail cone fairing and rudder tip and secure with attachment screws. Secure access panel to the aft section of fuselage.

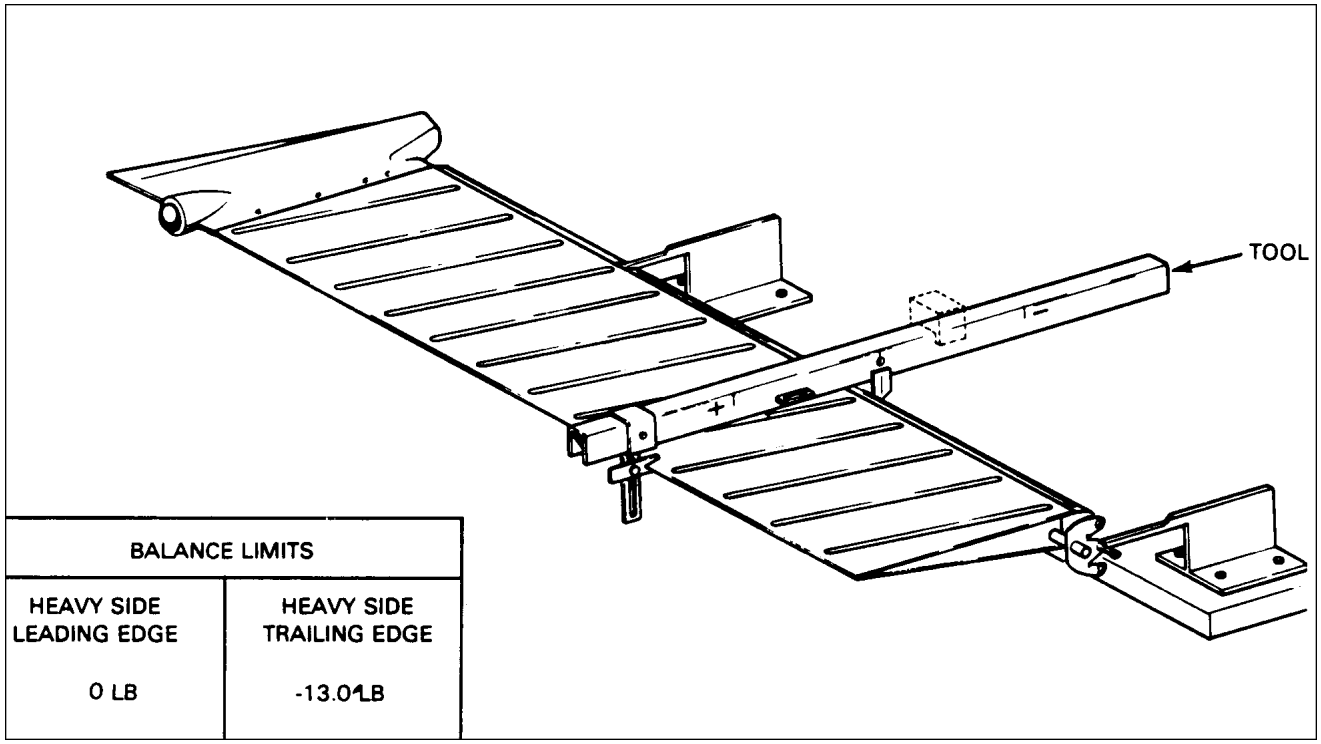
C. BALANCING RUDDER. (Refer to Figure 55-5.)

To balance rudder, assembly must be complete including tip assembly with all attaching screws and position light wiring. Place complete assembly horizontally on knife edge supports in a draft free area that allowing unrestricted movement. Place tool on rudder with beam perpendicular to hinge centerline. Calibrate tool as per Figure 55-4. Read scale when bubble level has been centered by adjustment of the movable weight and determine static balance limit. If static balance is not per limits in Figure 55-5, proceed as follows:

1. Nose Heavy: This condition is highly improbable; recheck calculations and measurements.
2. Nose Light: If the mass balance weight is too light or rudder is too heavy due to painting, strip paint and repaint. If rudder is too heavy due to repairs, the repair must be removed and damaged parts replaced.

— NOTE —

A non-adjustable mass balance weight is moulded in the nose of rudder tip. All rudders must be maintained within static balance weights per in Figure 55-5.



BALANCE LIMITS	
HEAVY SIDE LEADING EDGE	HEAVY SIDE TRAILING EDGE
0 LB	-13.0 LB

Figure 55-5. Rudder Balance

THIS SPACE INTENTIONALLY LEFT BLANK

GRIDS 2L21 THROUGH 2L24
INTENTIONALLY LEFT BLANK

AIRPLANE

MAINTENANCE MANUAL

CARD 3 OF 4

PA-28-181
ARCHER II
ARCHER III

PIPER AIRCRAFT CORPORATION

(PART NUMBER 761 679 **July 30, 1994**

3A1

Island Enterprises

Published by
Technical Publications

Piper Aircraft Corporation
2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member of GAMA
General Aviation
Manufacturers Association

3A2

Island Enterprises

INTRODUCTION

AEROFICHE EXPLANATION AND REVISION STATUS

The Maintenance Manual information incorporated in this set of Aerofiche cards has been arranged in accordance with the general specifications of Aerofiche adopted by the General Aircraft Manufacturer's Association (GAMA).

Conversion of Aerofiche alpha/numeric code numbers:
First number is the Aerofiche card number.
Letter is the horizontal line reference per card.
Second number is the vertical line reference per card.
Example: 2J16 = Aerofiche ,card number two of given set, Grid location J16.

The following is provided to aid in locating the various chapters and related service information desired.

1. A complete manual System/Chapter Index Guide is given at Grids A8 thru A9 of all fiche in this set.
2. A complete list of Illustrations is given at Grids A10 thru A14 of all fiche in this set.
3. A complete list of Charts is given at Grids A15 and A16 of all fiche in this set:
4. A complete list of paragraph titles and appropriate Grid location numbers is given at the beginning of each Chapter relating to the information within that Chapter.
5. Identification of Revised Material.

   Revised text and illustrations are indicated by a black vertical line along the left hand margin of the frame, opposite revised, added or deleted material. Revision lines indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation, indexing, the physical location of material or complete page additions are not identified by revision lines.
6. Revisions to this Maintenance Manual 761 679, issued August 16, 1978, are as follows:

Revisions	Date	Aerofiche Card Effectivity
ORG780816	August 16,1978	—
CR870801	September 16, 1987	1, 2 and 3
CR940731	July 31. 1994	1, 2, 3 and 4

The date on Aerofiche cards should not be earlier than the date noted for the respective card effectivity. Consult the latest Aerofiche card in this series for current Aerofiche card effectivity.

VENDOR PUBLICATIONS.

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

ENGINE:

Overhaul Manual = AVCO LYCOMING - OVERHAUL MANUAL
DIRECT DRIVE ENGINE - P/N 60294-7
Avco Lycoming Division
Williamsport, PA 17701

Parts Catalog = AVCO LYCOMING - P/N PC-102
Avco Lycoming Division
Williamsport, PA 17701

Operators Handbook = AVCO LYCOMING O-360
SERIES AIRCRAFT ENGINES - P/N 60297-9
Avco Lycoming Division
Williamsport, PA 17701

PROPELLER:

Repair Manual = METAL PROPELLER REPAIR MANUAL
Sensenich Corporation
P.O. Box 1168, Lancaster, PA 17604

MAGNETOS:

Service Manual = SLICK-AIRCRAFT MAGNETOS
Catalog and Service Manual
SLICK ELECTRO Inc
Rockford, IL 61101

WHEEL AND STRUT FAIRINGS:

Repair Manual = A.B.S. THERMOPLASTIC LANDING GEAR
WHEEL AND STRUT FAIRING REPAIR
INSTRUCTION MANUAL - P/N 761 708
Vero Beach Service Sales Department
Piper Aircraft Corporation
Vero Beach, Florida 32960

DRY AIR PUMPS:

Service Information = AIRBORNE DIVISION
AIR AND FUEL PRODUCTS
Parker Hannifin Corporation
711 Taylor St.
Elyria, OH 44036

AUTO FLIGHT:

SEE CHAPTER 22 AUTO FLIGHT

SERIAL NUMBER INFORMATION

PA-28-181, ARCHER II - 1976
Serial Numbers 28-7690001 to 28-7690479 inclusive
PA-28-181, ARCHER II - 1977
Serial Numbers 28-7790001 to 28-7790607 inclusive
PA-28-181, ARCHER II -1978
Serial Numbers 28-7890001 to 28-7890564 inclusive
PA-28-181, ARCHER II - 1979
Serial Numbers 28-7990001 to 28-7990626 inclusive
PA-28-181, ARCHER II - 1980
Serial Numbers 28-8090001 to 28-8090382 inclusive
PA-28-181, ARCHER II - 1981
Serial Numbers 28-8190001 to 28-8190336 inclusive
PA-28-181, ARCHER II - 1982
Serial Numbers 28-8290001 to 28-8290188 inclusive
PA-28-181, ARCHER II - 1983
Serial Numbers 28-8390001 to 28-8390090 inclusive
PA-28-181, ARCHER II - 1984
Serial Numbers 28-8490001 to 28-8490112 inclusive
PA-28-181, ARCHER II - 1985
Serial Numbers 28-8590001 to 28-8590092 inclusive
PA-28-181, ARCHER II - 1986
Serial Numbers 28-8690001 to 28-8690056 inclusive
Serial Numbers 2890001 to 2890205*
PA-28-181, ARCHER III
Serial Numbers 2890206 and up

*New method of assigning serial numbers used.

GAMA SYSTEM/CHAPTER INDEX GUIDE

SYST CHAP	SUB-SYST SECTION TITLE	AEROFICHE GRID NO.
4	AIRWORTHINESS	1A17
5	TIME LIMITS/MAINT CHECKS	1A21
6	DIMENSIONS AND AREAS	1B15
7	LIFTING AND SHORING	1C4
8	LEVELING AND WEIGHING	1C9
9	TOWING AND TAXIING	1C14
10	PARKING AND MOORING	1C18
11	PLACARDS AND MARKINGS	1C22
12	SERVICING	1D9
20	STANDARD PRACT - AIRFRAME	1E19
21	ENVIRONMENTAL SYSTEM	1F18
22	AUTOFLIGHT	1I6
23	COMMUNICATIONS	1I11
24	ELECTRICAL POWER	1J3
25	EQUIPMENT/FURNISHINGS	2A17
27	FLIGHT CONTROLS	2A24
28	FUEL	2D10
32	LANDING GEAR	2E16
33	LIGHTS	2G8
34	NAVIGATION & PITOT/STATIC	2H14

GAMA SYSTEM/CHAPTER INDEX GUIDE (CONTD)

SYST CHAP	SUB-SYST SECTIONTITLE	AEROFICHE GRID NO.
37	VACUUM SYSTEM	2I13
39	ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS	2J9
51	STRUCTURES	2J19
52	DOORS	2K18
55	STABILIZERS	2L7
56	WINDOWS	3A17
57	WINGS	3B3
61	PROPELLER	3B24
70	STANDARD PRACTICES - ENGINE	3C10
71	POWER PLANT	3C15
73	ENGINE FUEL SYSTEM	3D24
74	IGNITION	3E16
77	ENGINE INDICATING	3G7
78	EXHAUST	3G16
79	OIL SYSTEM	3G23
80	STARTING	3H10
91	CHARTS AND WIRING DIAGRAMS	3I4
91	CHARTS AND WIRING DIAGRAMS (CONT.)	4A17

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
6-1.	Three View - Archer II	1B20
6-2.	Three View - Archer III	1B21
6-3.	Station References - Archer II	1B22
6-4.	Station References - Archer III	1B24
6-5.	Access Plates and Panels	1B20
7-1.	Jacking Arrangement	1C7
8-1.	Leveling Longitudinally	1C11
8-2.	Leveling Laterally	1C11
8-3.	Weighing Airplane	1C12
11-1.	External Placards and Decals - Archer II	1C24
11-2	External Placards and Decals - Archer III	1D1
11-3	Internal Placards and Decals - Archer II	1D3
11-4	Internal Placards and Decals - Archer III	1D5
12-1.	Fuel Filter Bowl and Screen	1D14
12-2.	Servicing Points	1D19
12-3.	Main Gear Oleo Struts (cut-away view)	1D22
12-4.	Tire Balancer Fixture	1D24
12-5.	Lubrication Chart (Landing Gear, Main)	1E8
12-6.	Lubrication Chart (Landing Gear, Nose)	1E9
12-7.	Lubrication Chart (Control System)	1E10 thru 1E13
12-8.	Lubrication Chart (Cabin Door, Baggage Door and Seat)	1E14
12-9.	Lubrication Chart (Power Plant and Control Pivot Points)	1E15
12-10.	Lubrication Chart (Air Conditioning Condenser)	1E16
20-1.	Torque Wrench Formula	1E22
20-2.	Installing Rod End Bearings	1E23
20-3.	Cherrylock Rivet Removal	1E24
20-4.	Hose and Line Markings	1F1
20-5.	Flareless Tube Fittings	1F2
21-1.	Cabin Heater, Defroster, and Fresh Air System (Archer II)	1F23
21-2.	Overhead Vent System (not available with air conditioning) (Archer II)	1F24
21-3.	Cabin Heater, Defroster, and Fresh Air System (Archer III)	1G1
21-4.	Overhead Vent System (Archer III)	1G2
21-5.	Air Conditioning System Installation (Typical)	1G11
21-6.	Service Valves - Archer II (Sheet 1 of 2)	1G17
21-6.	Service Valves - Archer III (Sheet 2 of 2)	1G17
21-7.	Test Manifold and Charging Cart	1G18
21-8.	Manifold Set Operation	1G18
21-9.	Manifold to Recharging/Test Stand Hookup	1G19
21-10	Robinair 34700 Control Panel and Hose Connections	1G20
21-11	Robinair 34700 Hose Hookup	1G21
21-12	Compressor and Fabricated Oil Dipstick	1H6

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
21-13.	Compressor and Alternator Belt Installation (Sheet 1 of 2)	1H8
21-13.	Compressor and Alternator Belt Installation (Sheet 2 of 2)	1H9
21-14.	Magnetic Clutch	1H11
21-15.	Condenser Air Scoop Installation	1H14
21-16.	Expansion Valve	1H15
21-17.	Components Installation	1H17
21-18.	Air Conditioning Wiring Schematic (typical) - Archer II Sheet 1 of 2	1H19
21-18.	Air Conditioning Wiring Schematic (typical) - Archer III Sheet 2 of 2	1H20
23-1.	Two Year, Magnesium Battery Connections	1I15
23-2.	Communications Components Corporation ELT Schematic	1I16
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 1 of 2) (S/N's 28-7990457 thru 28-8690056 and 2890001 thru 2890065)	1I17
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 2 of 2) (S/N's 2890066 thru 2890139)	1I17
23-4.	ELT Portable Folding Antenna (Narco)	1I18
23-5.	ELT Using Fixed Aircraft Antenna (Narco)	1I18
23-6.	Narco ELT 910 Emergency Locator Transmitter Schematic	1I20
23-7.	ELT 910 Battery Pack	1I21
23-8	Artex 110 E. L. T.	1I22
23-9	Artex E. L. T. 110 Wiring Schematic	1I23
24-1.	Exploded View of Prestolite Alternator	1J16
24-2.	Lamp-Bank Load	1J16
24-3.	Removal of Slip Ring End Bearing (Prestolite Alternator)	1J20
24-4.	Removal of Rectifier (Prestolite Alternator)	1J20
24-5.	Removal of Drive End Head (Prestolite Alternator)	1J20
24-6.	Removal of End Head Bearing (Prestolite Alternator)	1J20
24-7.	Testing Rotor for Ground (Prestolite Alternator)	1J22
24-8.	Testing Rotor for Shorts (Prestolite Alternator)	1J22
24-9.	Installation of Bearing (Prestolite Alternator)	1J22
24-10.	Installation of Rectifier (Prestolite Alternator)	1J22
24-11.	Terminal Assembly (Prestolite Alternator)	1J24
24-12.	Slip Ring End Bearing Assembly (Prestolite Alternator)	1J24
24-13.	Testing Prestolite Alternator	1J24
24-14.	Prestolite Brush Installation	1J24
24-15.	Prestolite Alternator Internal Wiring Diagram	1K2
24-16.	Exploded View of Chrysler Alternator	1K3

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-17.	Checking Chrysler Alternator Field Coil Current Draw	1K5
24-18.	Testing Chrysler Alternator Field Circuit	1K6
24-19.	Chrysler Alternator Rectifier End Shield and Stator Assembly	1K7
24-20.	Testing Chrysler Alternator Positive Rectifiers with C3829 Tester	1K8
24-21.	Testing Chrysler Alternator Negative Rectifiers with C-3829 Tester	1K8
24-22.	Testing Chrysler Alternator Positive Rectifiers with Test Lamp	1K9
24-23.	Testing Chrysler Alternator Negative Rectifiers with Test Lamp	1K9
24-24.	Chrysler Alternator Rectifier and Heatsink Assembly Removal	1K10
24-25.	Chrysler Alternator Rectifier End Shield Assembly	1K10
24-26.	Testing Chrysler Alternator Stator	1K11
24-27.	Removal of Chrysler Alternator Pulley	1K11
24-28.	Removal of Chrysler Alternator Bearing	1K11
24-29.	Removal of Chrysler Alternator Rectifier End Shield Bearing	1K11
24-30.	Testing Chrysler Alternator Rotor for Ground	1K12
24-31.	Testing Chrysler Alternator Rotor for Opens or Shorts	1K12
24-32.	Installation of Chrysler Alternator Grease Retainer	1K13
24-33.	Installation of Chrysler Alternator Rectifier End Shield Bearing	1K13
24-34.	Installation of Chrysler Alternator Drive End Shield Bearing	1K14
24-35.	Installation of Chrysler Alternator Pulley	1K14
24-36.	Installation of Chrysler Alternator Insulators	1K14
24-37.	Installation of Chrysler Alternator Positive Rectifier Assembly	1K14
24-38.	Installation of Chrysler Alternator Capacitor	1K5
24-39.	Installation of Chrysler Alternator Battery Output Insulator	1K15
24-40.	Installation of Chrysler Alternator Negative Rectifier Assembly	1K16
24-41.	Installation of Chrysler Alternator Stator	1K16
24-42	Exploded View of Electrosystems Alternator	1K18
24-43	Eight Resistor-Bank Load	1K19
24-44.	Removal of Slip Ring End Bearing (Electrosystems Alternator)	1K21
24-45.	Removal of Rectifier (Electrosystems Alternator)	1K21
24-46.	Removal of Drive End Head (Electrosystems Alternator)	1K22
24-47.	Removal of End Head Bearing (Electrosystems Alternator)	1K22

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-48.	Testing Rotor for Ground (Electrosystems Alternator)	1K23
24-49.	Testing Rotor for Shorts (Electrosystems Alternator)	1K23
24-50.	Installation of Bearing (Electrosystems Alternator)	1K23
24-51.	Installation of Rectifier (Electrosystems Alternator)	1K23
24-52.	Terminal Assembly (Electrosystems Alternator)	1L1
24-53.	Slip Ring End Bearing Assembly (Electrosystems Alternator)	1L1
24-54.	Testing Electrosystems Alternator	1L1
24-55.	Electrosystems Alternator Brush Installation	1L2
24-56.	Electrosystems Alternator Internal Wiring Diagram	1L3
24-57.	Lamar Regulator Check	1L15
24-58.	Lamar Overvoltage Check	1L15
25-1.	Seat Back Lock	2A19
25-2.	Lunbar Seat Bladder Installation	2A21
27-1.	Rod End Installation Method	2B5
27-2.	Control Cable Inspection Technique	2B5
27-3.	Cable Wear Patterns	2B6
27-4.	Internal Cable Wear	2B7
27-5.	Pulley Wear Patterns	2B9
27-6.	Control Column Assembly	2B13
27-7.	Flex (Universal) Joint Assembly	2B15
27-8.	Aileron Controls (typical)	2B17
27-9.	Aileron Rigging Tool	2B20
27-10.	Fabricated Aileron and Flap Rigging Tool	2B20
27-11.	Bellcrank Rigging Tool	2B22
27-12.	Aileron Rigging	2B23
27-13.	Rudder and Steering Pedal Assembly	2C3
27-14.	Rudder Controls	2C5
27-15.	Rudder Rigging Tool	2C7
27-16.	Clamping Rudder Pedals	2C7
27-17.	Rudder Rigging	2C8
27-18.	Fabricated Rudder Rigging Tool	2C8
27-19.	Rudder Travel Adjustments	2C9
27-20.	Rudder Trim Control	2C10
27-21.	Stabilator Controls	2C16
27-22.	Stabilator Rigging Tool	2C17
27-23.	Fabricated Stabilator Rigging Tool	2C18
27-24.	Stabilator and Trim Travel Adjustments	2C18
27-25.	Stabilator Trim Control (Floor Control)	2C20
27-26.	Methods of Securing Trim Cables	2C21
27-27.	Flap Controls	2D3
27-28.	Flap Stop Adjustment	2D5
27-29.	Flap Rigging Tool	2D5
27-30.	Flap Rigging	2D7

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
28-1.	Archer II Fuel System Diagram	2D14
28-2.	Archer III Fuel System Diagram (S/N's 2890006 and up)	2D15
28-3.	Locking Gas Cap	2D20
28-4.	Fuel Filter Bowl and Screen	2D23
28-5.	Plunger Fuel Pump	2D24
28-6.	Tolerances, Union Nut,and Tubing Nut	2E3
28-7.	Resistance Decade Test Box Set Up	2E9
28-8	Archer III Fuel Quantity Needle Deviation	2E10
28-9.	Fuel Quantity Transmitter Checking Jig	2E12
28-10	Fabricated Fuel Quantity Transmitter Checking Jig	2E13
32-1.	Main Gear Oleo Strut Assembly	2F1
32-2.	Orifice Replacement Tool	2F2
32-3.	Main Gear Installation	2F4
32-4.	Nose Gear Oleo Strut Assembly	2F8
32-5.	Retainer Ring Tool	2F10
32-6.	Nose Gear Installation	2F11
32-7.	Clamping Rudder Pedals in Neutral Position	2F14
32-8	Rudder Pedals at Neutral Angle	2F14
32-9.	Main Wheel Assembly	2F16
32-10.	Nose Wheel Assembly	2F18
32-11.	Brake Assembly	2F19
32-12.	Removal and Installation of Anchor Bolts	2F20
32-13.	Disc Brake Minimum Thickness	2F22
32-14.	Brake System Installations	2F22
32-15.	Brake Master Cylinder (Hand/Parking Brake)	2F23
32-16.	Toe Brake Installation	2G1
32-17.	Brake Cylinder 10-27, 10-30, and 17000 (Toe Brake)	2G2
33-1.	Archer II Annunciator Panel	2G21
33-2.	Archer III Annunciator Panel and Box Assembly	2G22
33-3	Archer II Strobe Light Connections	2H3
33-4	Archer III Landing Light Installation	2H6
33-5	Archer III Landing Light Adjustment	2H7
33-6	Archer III Strobe Light Connections	2H10
34-1.	Pitot/Static System	2H19
37-1.	Archer II Auxiliary Vacuum Pump Installation	2J1
37-2	Archer III Auxiliary Vacuum Pump Installation	2J2
37-3	Archer II and III Auxiliary Vacuum Electrical Schematic	2J3
51-1.	Skin Materials and Thickness	2K2
51-2	Baggage Compartment Inspection Holes Cutout Details	2K4
51-3.	Surface Scratches, Abrasions, or Ground-in-Dirt	2K8
51-4.	Deep Scratches, Shallow Nicks, and Small Holes	2K9
51-5.	Mixing of Epoxy Patching Compound	2K9
51-6.	Welding Repair Method	2K11
51-7.	Repairing of Cracks	2K11

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
51-8.	Various Repairs	2K12
51-9.	Repair of Stress Lines	2K13
51-10.	Repair of Impacted Damage	2K13
52-1.	Installation of Door Snubber	2L1
52-2.	Fabricated Tool for Baggage Door Lock	2L5
55-1.	Empennage Group Installation	2L12
55-2.	Methods of Securing Control Cables	2L13
55-3.	Stabilator Balance	2L13
55-4.	Control Surface Balancing Tool	2L14
55-5.	Rudder Balance	2L20
56-1.	Windshield Installation - Typical	3A22
56-2.	Single Pane Side Window Installation, - Typical	3A24
57-1.	Installation of Stall Strips	3B8
57-2.	Wing Installation	3B11
57-3.	Aileron and Flap Installation	3B19
57-4.	Aileron Balance Configuration	3B21
61-1.	Typical Nicks and Removal Method	3C4
61-2.	Archer II Propeller Installation	3C6
61-3.	Archer III Propeller Installation	3C7
71-1.	Static Rpm (Sea Level ± 500 Feet Pressure Altitude Only)	3D4
71-2.	Change in Static Rpm Vs. Engine Oil Temperature	3D5
71-3.	Psychromatic Chart	3D6
71-4.	Archer II Engine Installation	3D9
71-5.	Archer III Engine Installation	3D10
71-6.	Archer II Cowling	3D15
71-7.	Archer III Cowling (S/N’s 2890206 and up)	3D15
71-8.	Ice Detection System	3D22
73-1.	Carburetor	3E5
73-2.	Archer II Engine Primer	3E6
74-3.	Archer III Fuel Primer System	3E7
73-4.	Adjustment of Engine Controls	3E10
73-5	Archer III Instrument Cluster - Fuel Pressure Gauge	3E14
74-1.	T-100 Assembly and Timing Tool Kit	3E23
74-2.	Removing Coil Wedges	3F2
74-3.	Exploded View of 4200 Series Magneto	3F3
74-4.	Index Plate and Timing Plug	3F5
74-5.	Installation of Bearings and Bearing Plate	3F5
74-6.	Magneto Oil Seal Installation on T-100	3F7
74-7.	Magneto Internal Timing	3F7
74-8.	Bendix Magneto Inspection	3F9
74-9.	Contact Spring Inspection	3F10
74-10.	Impulse Coupling	3F10
74-11.	Magneto Timing Marks	3F12
74-12.	Timing Pointer	3F12

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
74-13.	Timing Kit Installed	3F12
74-14.	Breaker Compartment With Cast Timing Marks	3F12
74-15.	Stripping Tool	3F18
74-16.	Inserting Stripping Tool	3F18
74-17.	Cutting Insulation	3F18
74-18.	Removing Silicone Rubber From Wire	3F18
74-19.	Installation of Plug End Nut	3F19
74-20.	Flaring Out the Shielding	3F19
74-21.	Installation of Ferrule	3F19
74-22.	Driving Tool	3F19
74-23.	Installation in Housing	3F21
74-24.	Securing Wire in Housing	3F21
74-25.	Installation of Electrical Screw	3F21
74-26.	Installation of Insulation Sleeve	3F21
74-27.	Installation of Spring	3F22
74-28.	Removing Spark Plug Frozen to Bushing	3F22
74-29.	Archer II Ignition Switch Installation	3G2
74-30.	Archer III Starter Switch Installation	3G2
74-31.	Archer III Magneto Switch(es) Installation	3G3
77-1.	Exhaust Gas Temperature Probe Installation	3G14
78-1.	Archer II Exhaust System Inspection Points	3G20
78-2	Archer III Exhaust System Inspection Points	3G20
80-1.	Exploded View of Gear Reduction Starting Motor	3H14
80-2.	Turning Starting Motor Commutator	3H19
80-3.	Testing Motor Armature for Shorts	3H19
80-4.	Testing Motor Fields for Grounds	3H20
80-5.	No-Load Test Hookup	3H22
80-6.	Stall-Torque Hookup	3H22

Refer to Electrical Schematic Table of Contents 4A18

LIST OF CHARTS

FIGURE NO.	SUBJECT	GRID NO.
601	Leading Particulars and Principal Dimensions	1B18
1201	Thread Lubricants	1E5
1202	Type of Lubricants	1E6
2001	Maximum Distance Between Supports for Fluid Tubing	1F3
2002	Types of Metal Corrosion	1F9
2101	Troubleshooting Air Conditioner	1G5
2102	Troubleshooting Air Conditioning System	1G7
2103	Refrigerant Temperature Pressure	1G13
2104	Aluminum Tubing Torque (Archer II)	1G16
2105	Recommended Torque Specifications (Archer III)	1G16
2106	System Vacuum	1G19
2107	Compressor Oil Charge	1H7
2108	Compressor Misalignment and Idler Pulley Nominal Location	1H7
2109	Blower System Wire Color Codes	1I3
2401	Troubleshooting Alternator	1J9
2402	Troubleshooting (Battery)	1J13
2403	Prestolite Alternator Specifications	1K1
2404	Chrysler Alternator Specifications	1K17
2405	Electrosystems Alternator Specifications	1L3
2406	Alternator Belt Tension	1L4
2407	Hydrometer Reading and Battery Charge Percent Archer II, 12 Volt System	1L6
2408	Hydrometer Reading and Battery Charge Percent Archer III, 24 Volt System	1L10
2409	Electrolytic Temperature Corrections	1L10
2410	Specific Gravity Temperature Correction	1L11
2411	Discharge Rate	1L11
2412	Electrolyte Freezing Point	1L12
2413	(Archer II) Electrical System Component Loads	1L22
2414	(Archer III) Electrical System Component Loads	1L23
2701	Cable Tension Vs. Ambient Temperature	2B4
2702	Troubleshooting Aileron Control System	2B11
2703	Troubleshooting Rudder Control System	2C1
2704	Troubleshooting Rudder Trim Control System	2C2
2705	Troubleshooting Stabilator Control System	2C13
2706	Troubleshooting Stabilator Manual Trim Control	2C14
2707	Troubleshooting Flap Control System	2D2
2801	Troubleshooting (Fuel System)	2D16
2802	Transmitter/Fuel Gauge Tolerances	2E7
2803	Fuel Quantity Gauge Resistance/Tolerances Values	2E7
2804	14 Vdc Fuel Quantity Gauge Tolerance Values	2E8
2805	28 Vdc Fuel Quantity Gauge Resistance/Tolerance Values	2E9
2806	28 Vdc Fuel Quantity Gauge Tolerance Values	2E10
2807	Fuel Quantity Transmitter Calibration Tolerances	2E11
2808	Troubleshooting Fuel Quantity Indicator	2E14
3201	Troubleshooting (Landing Gear)	2E20

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
3202	Nose Gear Alignment Tolerances	2F13
3301	Archer III Annunciator Panel Function Description	2G15
3302	Troubleshooting Archer II Annunciator Panel	2G16
3303	Troubleshooting Archer III Annunciator Panel	2G18
3401	Troubleshooting Vertical Speed Indicator	2H21
3402	Troubleshooting Altimeter	2H22
3403	Troubleshooting Pitot/Static Tubes and Airspeed Indicator)	2H23
3404	Troubleshooting Attitude Deviation Indicator	2I4
3405	Troubleshooting Heading (Directional Gyro) Indicator	2I7
3406	Troubleshooting (Magnetic Compass)	2I8
3407	Troubleshooting Turn Indicator	2I10
3701	Troubleshooting Vacuum System	2I16
5101	List of Materials For Thermoplastic Repair	2K7
6101	Archer II Propeller Torque Limits	3C5
7101	Engine Fault Isolation	3C19
7102	Propeller Applicability	3D2
7103	Static Rpm With 76EM8S5-0-62 or 76EM8S14-0-62 Propellers	3D7
7301	Troubleshooting Fuel Pressure Gauge	3E12
7302	Archer III Instrument Calibration Chart	3E13
7401	Troubleshooting Archer II Magnetos	3E19
7701	Troubleshooting (Tachometer)	3G11
7702	Troubleshooting (Exhaust Gas Temperature Gauge) (Alcor)	3C24
7901	Troubleshooting Archer II Engine Oil Pressure Gauge	3H6
7902	Troubleshooting Archer II Engine Oil Temperature Gauge	3H6
7903	Troubleshooting Archer III Engine Oil Pressure Gauge	3H7
7904	Troubleshooting Archer IIi Engine Oil Temperature Gauge	3H8
8001	Troubleshooting (Starter)	3H14
8002	Starting Motor Specifications	3H23
9101	Flare Fitting Torques	3I7
9102	Recommended Nut Torques	3I8
9103	Decimal Conversions	3I10
9104	Torque Conversion Tables	3I11
9105	Conversion Table Notes	3I12
9106	Metric Conversion Tables	3I13
9107	Decimal/Millimeters Equivalents of Drill Sizes	3I6
9108	Ball Diameters For Testing Hose Restrictions	3I8
9109	Hose Specifications	3I9
9110	List of Consumable Materials	3I20
9111	Vender Information	3J4
9112	Electrical Wire Coding	3J7
9113	Electrical Symbols	3J8

CHAPTER

56

WINDOWS

3A17

CHAPTER 56 - WINDOWS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
56-00-00	GENERAL	3A20	
56-10-00	FLIGHT COMPARTMENT	3A21	
56-10-00	Removal of Windshield	3A21	
56-10-00	Installation of Windshield	3A21	
56-20-00	CABIN	3A24	
56-20-00	Removal of Side Windows	3A24	
56-20-00	Installation of Side Windows	3A24	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

This chapter gives information on service and replacement procedures of the flight compartment and cabin windows.

THIS SPACE INTENTIONALLY LEFT BLANK

FLIGHT COMPARTMENT

A. REMOVAL OF WINDSHIELD

— NOTE —

A damaged windshield must be saved for a pattern for drilling required holes in new windshield.

1. Remove collar molding from around bottom of windshield and trim strip from between windshield halves by removing attaching screws.
2. Remove windshield by raising lower portion of windshield and carefully pulling it out and downward to release the top and side edges.
3. Clean old tape and sealer from windshield channels, strips, and divider post.

B. INSTALLATION OF WINDSHIELD (Refer to Figure 56-1.)

1. Verify new windshield outside contours are the same as the old windshield. If not the same, cut or grind new windshield to proper dimensions.
2. Apply black vinyl plastic tape around outer edges of entire windshield.
3. Apply Behr-Manning vinyl foam tape number 560 or equivalent over plastic tape, completely around edges of windshield.
4. Apply Behr-Manning sealant number PR 307, or equivalent, under edge of moldings and trim strips.
5. Place windshield in position for installation and slide windshield aft and up into place. Do not dislocate tape around the edges. Allow clearance between the two windshields at the divider post for expansion.
6. Lay sealant at the bottom and center (inboard) of windshield in the hollow between the outside edge and channel.
7. Lay a small amount of sealant under center trim strip, install, and secure.
8. Lay black vinyl tape on the underside of collar molding, install, and secure.
9. Use sealant on any areas around windshield that will allow water to penetrate past windshield.
10. Remove excess exposed sealer and tape.

THIS SPACE INTENTIONALLY LEFT BLANK

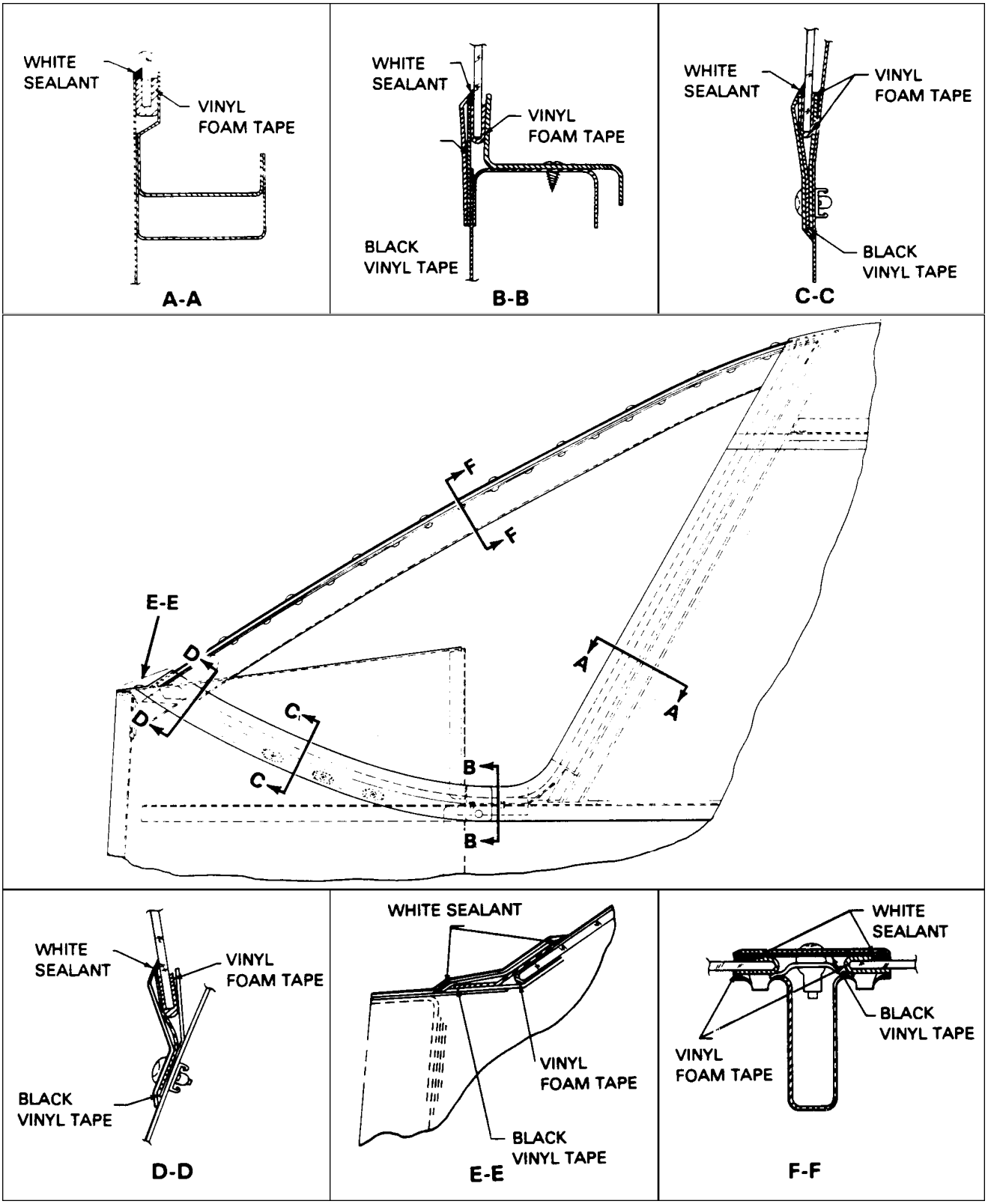


Figure 56-1. Windshield Installation - Typical

THIS PAGE INTENTIONALLY LEFT BLANK

CABIN

A. REMOVAL OF SIDE WINDOWS

— NOTE —

Damaged window must be saved to provide a pattern for shaping new window.

The PA-28-181 airplane is equipped with single pane side windows. Remove windows as follows:

1. Remove retainer molding from around window by removing attachment screws.
2. Carefully remove window from frame.
3. Remove excess tape and sealer from window frame and molding.

B. INSTALLATION OF SIDE WINDOWS. (Refer to Figure 56-2.)

1. Cut or grind new window to the same dimension as window removed.
2. Apply Behr-Manning vinyl foam tape number 560 or equivalent, on both sides of window around outer edges.
3. Apply Behr-Manning Sealant number PR 307, or equivalent, completely around outer surface of windows at all attachment flanges.
4. Insert window in frame and install retainer moldings.
5. Secure the molding with attachment screws and tighten until vinyl foam tape is 25 percent compressed by retainers.
6. Remove excess exposed sealer and tape.

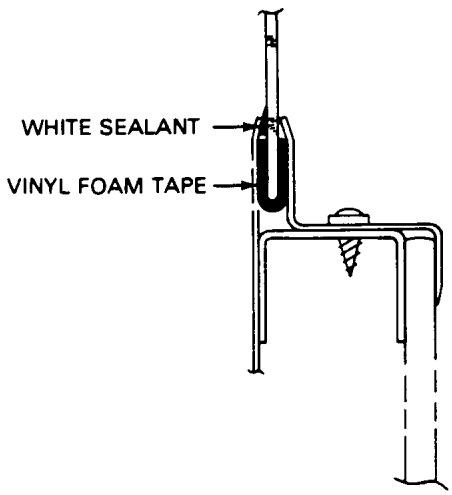


Figure 56-2. Single Pane Side Window Installation - Typical

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

57

WINGS

3B3

CHAPTER 57 - WINGS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
57-00-00	GENERAL	3B6	
57-00-00	Description	3B6	
57-20-00	AUXILIARY STRUCTURE	3B7	
57-20-00	Removal of Wing Tip	3B7	
57-20-00	Repair of Wing Tip	3B7	
57-20-00	Installation of Wing Tip	3B7	
57-20-00	Installation of Stall Strip	3B7	
57-40-00	ATTACH FITTINGS	3B10	
57-40-00	Removal of Wing	3B10	
57-40-00	Installation of Wing	3B10	
57-50-00	FLIGHT SURFACES	3B18	
57-50-00	Removal of Aileron	3B18	
57-50-00	Installation of Aileron	3B18	
57-50-00	Checking Aileron Free Play	3B18	
57-50-00	Balancing Aileron	3B18	
57-50-00	Wing Flap	3B18	
57-50-00	Removal of Wing Flap	3B18	
57-50-00	Installation of Wing Flap	3B19	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

This chapter gives removal and installation procedures for wings and related components installed on the ArcherII and Archer III airplanes.

DESCRIPTION

Each wing panel is an all metal, full cantilever, semi-monocoque type structure with removable tips and access panels. Attached to each wing are the aileron, flap, main landing gear, fuel tank and stall strips. Wings are attached to each side of fuselage by inserting butt ends of the main spars into a spar box carry through. The spar box is an integral part of fuselage structure which provides, in effect, a continuous main spar with splices at each side of fuselage. There are also fore and aft attachments at the front and rear spars.

— NOTE —

Major subassemblies of the wing may be removed individually or the wing may be removed as a unit. To remove a wing, a fuselage and wing supporting cradle is required.

THIS SPACE INTENTIONALLY LEFT BLANK

AUXILIARY STRUCTURE

A. REMOVAL OF WING TIP

1. Remove screws holding wing tip to the wing. Do not damage wing or wing tip. The ***Archer III*** has a landing light glareshield installed on the wing tip. It is secured to the wing by the two attachment screws on the top and at the leading edge of the wing, and must be removed, and set aside, when these two screws are removed.
2. On the ***Archer II***, pull off wing tip far enough to disconnect position and strobe light wire assembly. Disconnect ground lead at point of connection on wing rib. Disconnect positive lead at wire terminal or unscrew from light assembly.
   On the ***Archer III***, pull off wing tip far enough to disconnect position, strobe and landing light wire assemblies. Disconnect ground lead at point of connection on wing rib. Disconnect positive lead at wire terminal or unscrew from light assembly.
3. Inspect wing tip to verify there are no cracks, severe nicks or minor damage. If repair is required, refer to Chapter 51.
4. Inspect tip light shield for cracks, bends, or other minor damage. On the ***Archer III***, the landing light lens must also be inspected for cracks or other minor damage..

B. REPAIR OF WING TIP

Repair fiberglass wing tips per fiberglass repair procedures in Chapter 51. Badly damaged thermoplastic tips must be replaced.

C. INSTALLATION OF WING TIP

1. Place the wing tip in position to connect navigation and strobe light leads, and, on the ***Archer III***, the landing light wire assembly.
2. Connect ground lead to wing rib with screw and nut.
3. Connect positive lead to navigation light by connecting wire terminals or screwing connectors together.
4. Connect strobe and, on the ***Archer III***, the landing light wire assemblies
5. Insulate wire terminals and check ground lead is free of dirt and film to ensure a good connection.
6. Insert wing tip into position and install screws around tip. On the ***Archer III,*** install landing light glare shield.
6. Verify there is no damage to wing tip or wing.
7. Check operation of lights.

D. INSTALLATION OF STALL STRIP (Refer to Figure 57-1)

Archer II airplanes, s/n's 28-8090363 thorugh 28-8690134, 2890001 through 2890134, 2890136 through 2890136, and 2890145 may require that stall strips be added to the leading edge of both wings. Refer to the latest revision of Piper Service Bulletin No. 916B and kit No.765 399 for further information.

1. Locate the stall strip (Piper p/n 35802-3) at wing station (WS) 106.19, which is located at the leading edge skin splice outboard of the fuel tank.
2. Hold the stall strip in place with duct tape.
3. Spot the stall strip's two mounting holes on wing.
4. Remove stall strip. Drill two 0.144 inch (#27) diameter holes in wing skin at marked positions.

5. Install stall strip with two NAS 1738B4-3 blind rivets (Piper p/n 522-883).
6. Repeat steps ***a*** through ***e*** on the opposite wing.
7. Make appropriate entry in airplane's logbook or permanent maintainence records.

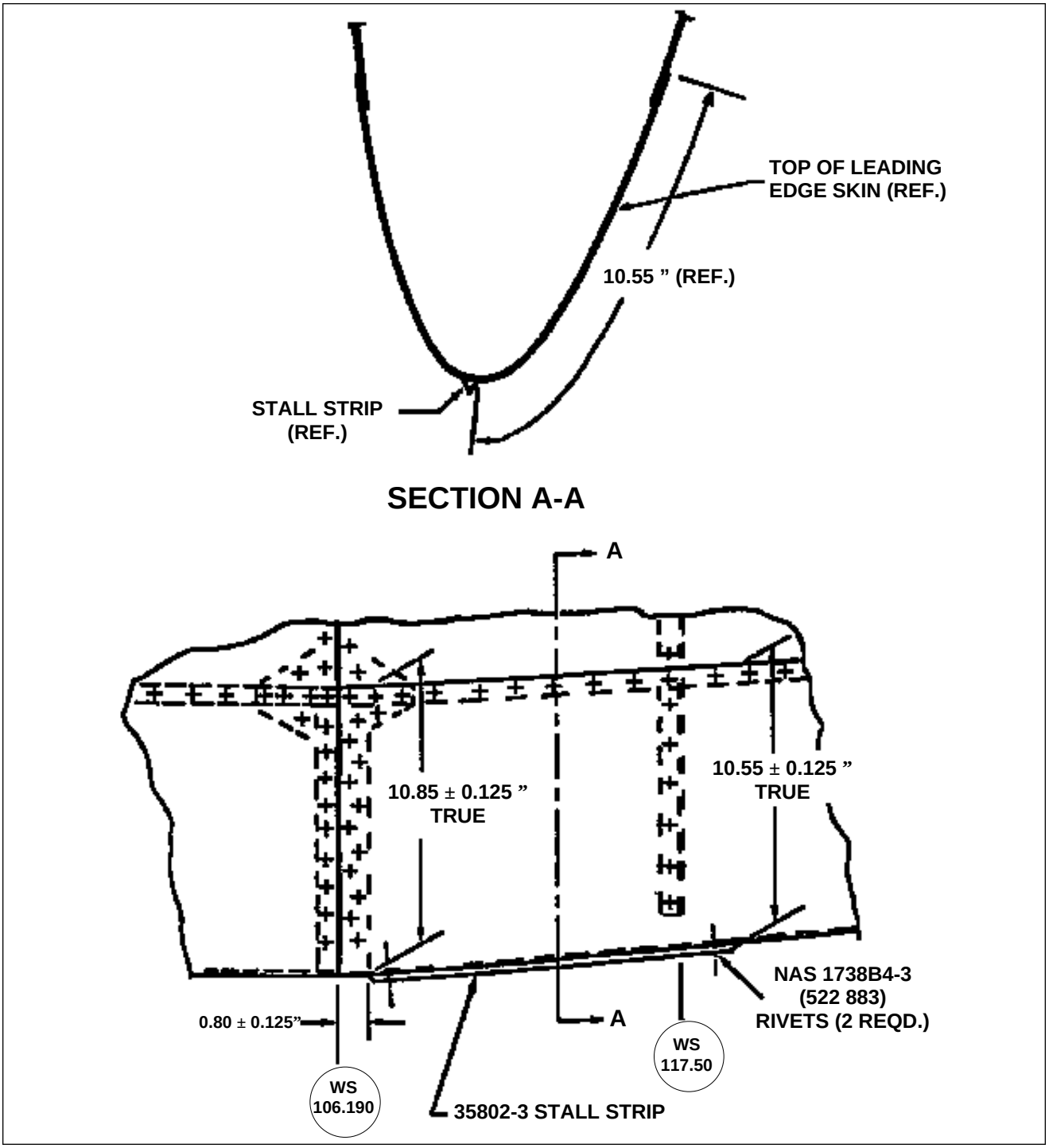


Figure 57- 1. Installation of Stall Strips

THIS PAGE INTENTIONALLY LEFT BLANK

ATTACH FITTINGS

A. REMOVAL OF WING (Refer to Figure 57-1.)

1. Close fuel valve and drain fuel from wing to be removed. (Refer to Draining Fuel System, Chapter 12.)
2. Drain brake lines and reservoir. (Refer to Draining Brake System, Chapter 12.)
3. Remove access plate at wing butt rib and wing inspection panels. (Refer to Access Plates and Panels, Chapter 6.)
4. Remove front and back seats from airplane.
5. Expose spar box and remove cockpit side trim panel assembly of wing being removed.
6. Place airplane on jacks. (Refer to Jacking, Chapter 7.)

— NOTE —

Mark cable and line ends to aid installation of control cables, and fuel and hydraulic lines. Attach a line where applicable to cables before drawing them through fuselage or wing.

7. Disconnect aileron balance and control cables at the turnbuckles within fuselage aft of spar.
8. If left wing is being removed, remove cotter pin from pulley bracket assembly to allow left aileron balance cable end to pass between pulley and bracket.
9. Disconnect flap from torque tube by extending flap to its fullest degree. Remove bolt and bushing from bearing at aft end of control rod.

—CAUTION—

To prevent damage or contamination of fuel, hydraulic, and miscellaneous lines, place a protective cover over line fittings and ends.

10. Disconnect fuel line at fitting located aft of spar at wing butt line.
11. Remove clamps necessary to release electrical harness assembly. Disconnect leads from terminal strip assembly by removing cover, appropriate nuts, and washers.
12. With trim panel removed, disconnect hydraulic brake line at fitting located within cockpit at leading edge of wing.
13. If left wing is being removed, disconnect pitot tube at the elbows located within cockpit at wing butt line.
14. Arrange suitable fuselage cradle and supports for both wings.
15. Remove wing jacks. Remove front and rear spar nuts, washers and bolts.
16. Remove eighteen main spar bolts.
17. Verify that all electrical leads, cables, and lines are disconnected.
18. Slowly remove wing.

B. INSTALLATION OF WING. (Refer to Figure 57-1.)

—NOTE—

New Service wings are not drilled for the aft attachment point. This will necessitate drilling a 0.375/0.376 hole for new hardware installation. Refer to figure 57-1, Sketch B for new hardware, notes, and torque for this fitting.

BOLT LEGEND			WASHER	
POSITION	BOLT*	NUT*	UNDER HEAD	UNDER NUT
A-1	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) AN960-616	(1) AN960-616 & (1) 9
A-2	AN176-12A OR NAS464-P6-LA11	MS21042-6	(1) AN960-616	(1) AN960-616 & (1) 9
A-3	AN176-12A OR NAS464-P6-LA11	MS21042-6	(1) AN960-616	(1) AN960-616 & (1) 9
A-4	AN176-12A OR NAS464-P6-LA11	MS21042-6	(1) AN960-616	(1) AN960-616 & (1) 9
B-1	AN176-14A OR NAS464-P6-LA15	MS21042-6	(1) AN960-616	(2) AN960-616
B-2	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) AN960-616	(2) AN960-616
B-3	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) AN960-616	(2) AN960-616
B-4	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) AN960-616	(2) AN960-616
C-1	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(1) AN960-616
C-2	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
C-3	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
C-4	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
C-5	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(1) 96352-3
D-1	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(1) AN960-616
D-2	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
D-3	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
D-4	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(2) AN960-616
D-5	AN176-13A OR NAS464-P6-LA13	MS21042-6	(1) 96352-3	(1) 96352-2

*Torque Boltheads on Upper Spar Cap and Nuts on Lower Spar Cap 360-390 in -lb

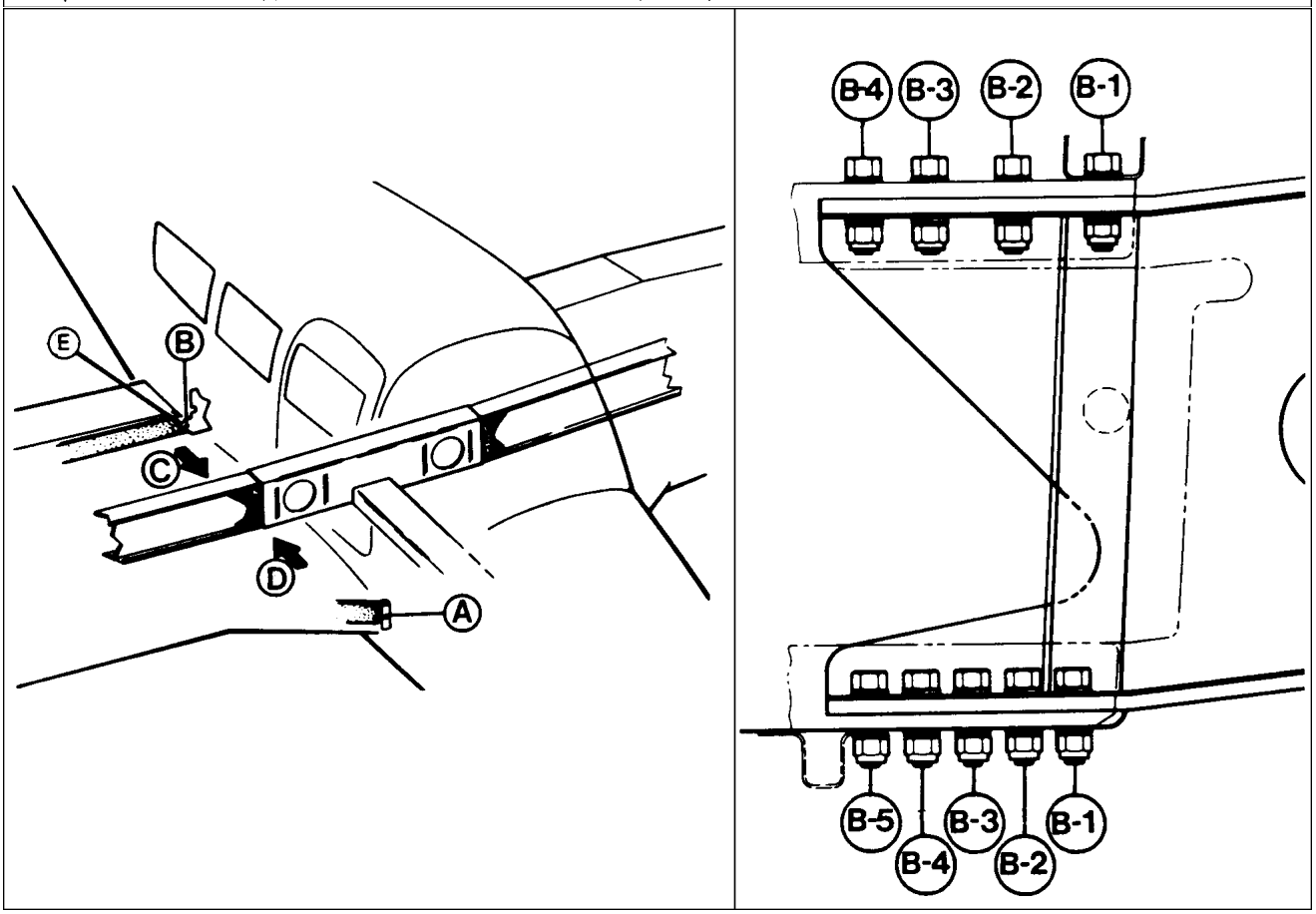


Figure 57-2. Wing Installation (Sheet 1 of 3)

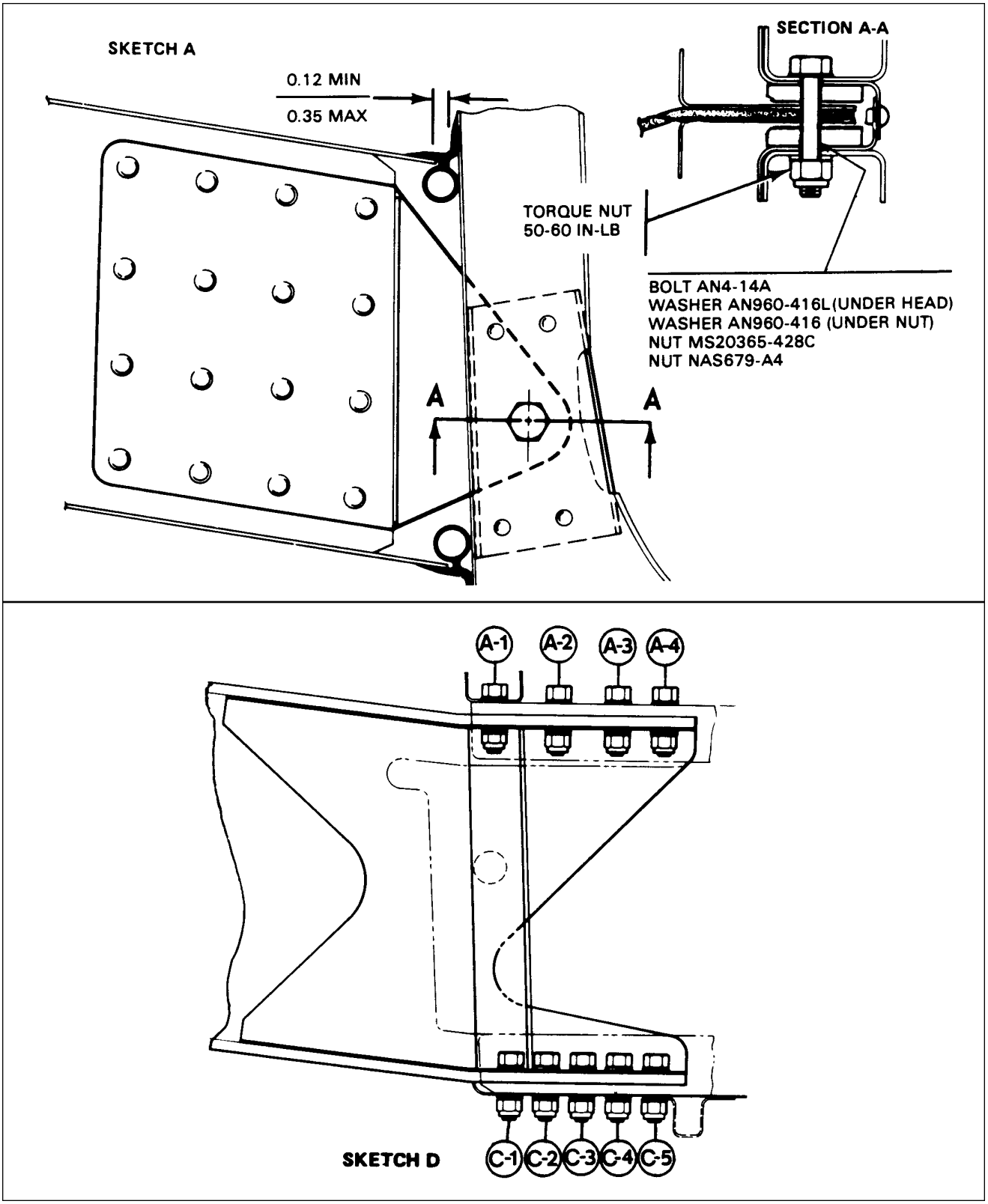
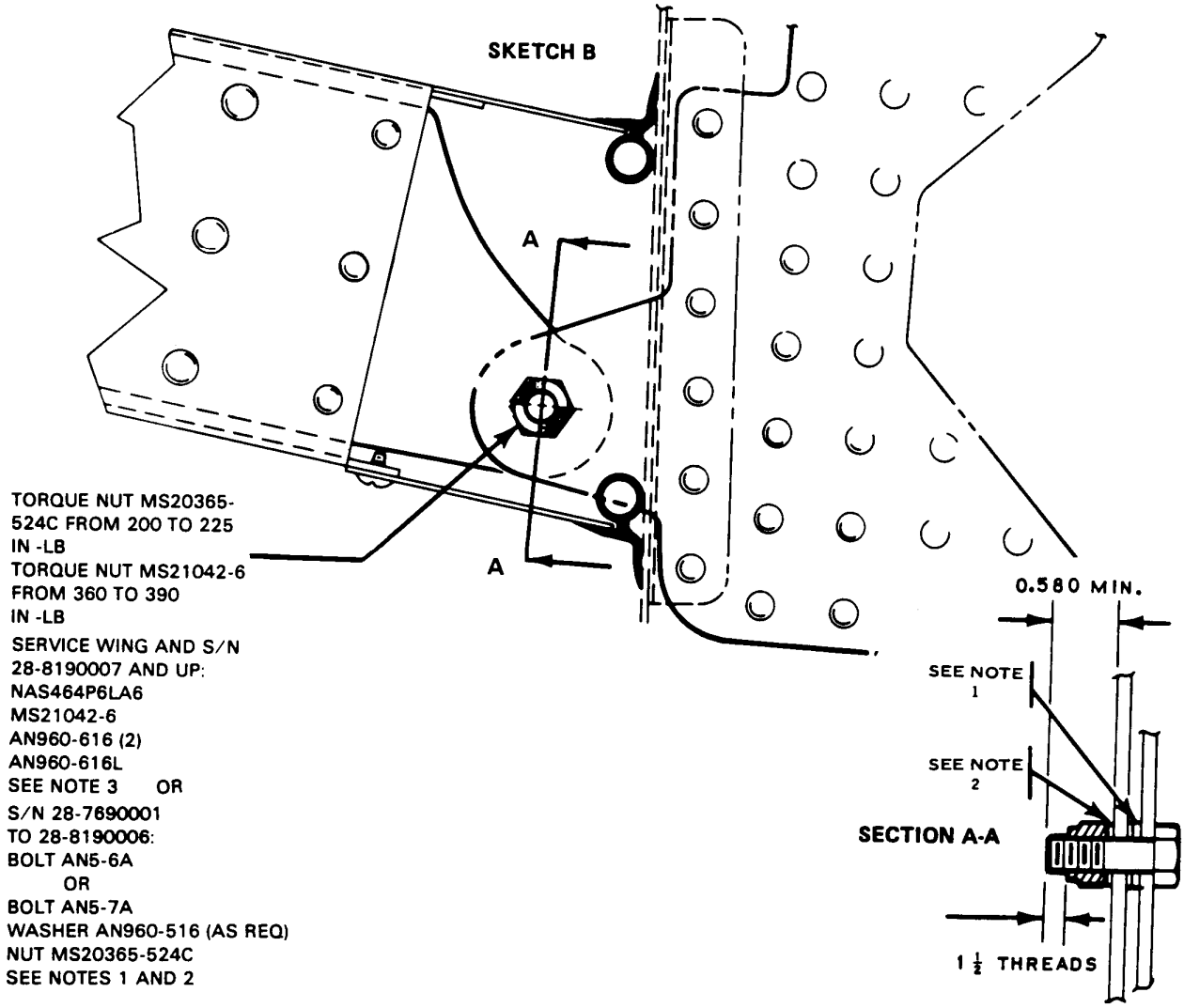


Figure 57-2. Wing Installation (Sheet 2 of 3)

CAUTION

IDENTIFY HARDWARE BEFORE INSTALLING WASHERS AND BEFORE TORQUING NUT.



NOTES

1. MAXIMUM OF (2) AN960-516 WASHERS BETWEEN FORWARD FACE OF WING FITTING AND AFT FACE OF FUSELAGE FITTING. FACES OF FITTING MAY BE AGAINST EACH OTHER.
2. AFTER REQUIRED WASHERS ARE INSERTED BETWEEN FITTINGS, INSTALL BOLT AND CHECK NO THREADS ARE BEARING ON THE FORWARD FITTING PRIOR TO INSTALLING NUT. USE SHORTEST BOLT WHICH WILL LEAVE 0.580 MINIMUM FROM FITTING TO END OF BOLT. ADD AN960-516 WASHERS AS REQUIRED (MINIMUM OF 1), TO LEAVE A MAXIMUM OF 1-1/2 VISIBLE THREADS OR A MINIMUM OF BOLT CHAMFER EXPOSED AFTER NUT IS TORQUED TO SPECIFICATIONS.
3. MAXIMUM NUMBER OF WASHERS ALLOWED BETWEEN FWD FACE OF WING FITTING AND AFT FACE OF FUSELAGE FITTING IS ONE AN960-616L AND ONE AN960-616. (ALL THREE WASHERS ARE ALWAYS REQUIRED WITH ONLY THE AN960-616L ALLOWED UNDER BOLT HEAD).

Figure 57-2. Wing Installation (Sheet 3 of 3)

— NOTE —

When replacing a wing assembly, verify wing butt clearance is maintained. (Refer to Sketch A, Figure 57-1.)

1. Check fuselage is positioned solidly on support cradle.
2. Place wing in position for installation, spar end a few inches from side of fuselage and set on trestles.
3. Prepare the various lines, control cables, etc, for inserting into the wing or fuselage when wing is slid into place. Verify front wing bushing is installed.
4. Slide wing into position on fuselage.
5. Install eighteen main spar bolts as listed in bolt legend.

— CAUTION —

Identify hardware before installing washers and before torquing nut.

6. Install bolt, washers, and nut attaching front spar with fuselage fitting. A minimum of one washer is required under the nut, add AN960-416 or AN960-916L washers as needed to leave a maximum one and one-half threads visible or a minimum of the bolt chamfer exposed.
7. Insert correct number of washers between the forward face of wing fitting and aft face of fuselage fitting. (Refer to Figure 57-1, Sketch B, Notes 1, 2 and 3.)
8. Install correct bolt, washers, and nut which attach rear spar to fuselage fitting. (Refer to Figure 57-1, Sketch B.)
9. Tighten the eighteen main spar bolt nuts or boltheads (refer to Figure 57-1, Sketch C) to torque of 360 to 390 inch-pounds. Check bolts are installed as per bolt legend. Tighten forward spar attachment bolt to a torque of 50 to 60 inch-pounds. Identify hardware, and tighten rear spar attachment bolt as per Figure 57-1, Sketch B.
10. Install wing jacks and tail support to tail skid with approximately 250 pounds ballast on base of tail support. Remove fuselage cradle and wing supports.
11. If left wing was removed, connect pitot tube at elbows within cockpit at wing butt line. Replace or install clamps as needed. If a heated pitot is installed, plus lead must be connected at fuselage.
12. Connect hydraulic brake line onto fitting in cockpit at wing leading edge.
13. Connect leads to appropriate posts on terminal strip and install washers and nuts. For assistance in connecting the electrical lead, refer to Electrical Schematics in Chapter 91.) Place clamps along electrical harness to secure it in position. Install terminal strip dust cover.
14. Remove cap from fuel line and connect at fitting located aft of spar at wing butt line.
15. Connect aileron balance and control cables at turnbuckles in fuselage aft of spar. After left balance cable is inserted through bracket assembly and connected, install a cotter pin cable guard in hole provided in bracket assembly.
16. Connect flap by placing flap handle in full flap position, place bushing on outside of rod end bearing and insert and tighten bolt.
17. Check rigging and control cable tension of ailerons and flaps. (Refer to Rigging and Adjustment of Ailerons, and Rigging and Adjustment of Flaps, Chapter 27.)
18. Service and refill brake system with hydraulic fluid per Servicing Brake System, Chapter 12. Bleed system per chapter 32 and check for fluid leaks.
19. Service and fill fuel system per Servicing Fuel System, Chapter 12. Open fuel valve and check for leaks and flow.

20. Check operation of all electrical equipment, and pitot system.
21. Remove airplane from jacks.
22. Install cockpit trim panel assembly, spar box carpet, front and back seats, and wing butt rubber molding.
23. Replace all access plates and panels on the wing involved.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

Island Enterprises

FLIGHT SURFACES

A. REMOVAL OF AILERON (Refer to Figure 57-2).

1. Disconnect aileron control rod at aileron attachment point by removing nut, washers, and bolt from rod end bearing. To simplify installation note location of washers removed.
2. Remove attaching screws, with nuts, from hinges at leading edge of aileron, and remove aileron by lowering inboard end and swinging it forward to allow balance arm to clear opening in outboard rib.

B. INSTALLATION OF AILERON (Refer to Figure 57-2).

1. Install balance arm into opening in outboard rib by moving inboard end of aileron forward to allow arm to be inserted through opening. Move aileron into place and install attaching screw and nuts. Verify aileron is free to move with no interference.
2. Attach aileron control rod with bolts, washers and nut, dividing washers so that aileron is free to rotate from stop to stop without control rod binding or rubbing on opening in aft spar. Verify rod end bearing has no side play when tightening bolt and that rod does not contact side of bracket.
3. Actuate aileron controls to ensure freedom of movement.

C. CHECKING AILERON FREE PLAY

Before balancing, check amount of free play in aileron as follows:

Set aileron in its neutral position and secure. Obtain a straightedge long enough to extend from ground up to a few inches above aileron trailing edge. Place straightedge next to aileron trailing edge and gently move aileron up and down, mark limit of travel (free play) on straightedge. Overall travel (free play) must not exceed 0.24 of an inch. If free play exceeds limit repair as required to eliminate excessive free play. Grasp aileron and move it spanwise (inboard/ outboard) to verify maximum end play of 0.035 inch is not exceeded.

D. BALANCING AILERON (Refer to Figure 57-3).

Position aileron on balancing fixture in a draft free area, allowing unrestricted movement of aileron. Place tool on aileron, avoid rivets and keep beam perpendicular to hinge centerline. Read scale when bubble level has been centered by adjustment of movable weight and determine static balance. If static balance is not within limits per Figure 57-3, proceed as follows:

1. Leading Edge Heavy: This condition is highly improbable; recheck measurements and calculations.
2. Trailing Edge Heavy: There are no provisions for adding weight to balance weight to counteract a trailing edge heavy condition. Verify exact cause of unbalance. If aileron is too heavy because of painting over old paint, strip all paint from aileron and repaint. If aileron is too heavy resulting from repair to skin or ribs, replace all damaged parts and recheck balance.

E. WING FLAP

1. Removal Of Wing Flap (Refer to Figure 57-2).

a. Extend flaps to their fullest degree and remove bolt and bushing from rod end bearing. Use an angle or offset screwdriver.
b. Remove nuts, washers, bushing, and hinge bolts holding flap to wing assembly.
c. Pull flap straight back off wing.

2. Installation Of Wing Flap (Refer to Figure 57-2).

a. Replace wing flap by placing flap onto its proper position and inserting hinge bolts, bushings, washers, and nuts.
b. With flap control in full flap position, place bushing on outboard side of rod end bearing and insert and tighten bolt.
c. Operate flap several times to be certain it is operating freely.

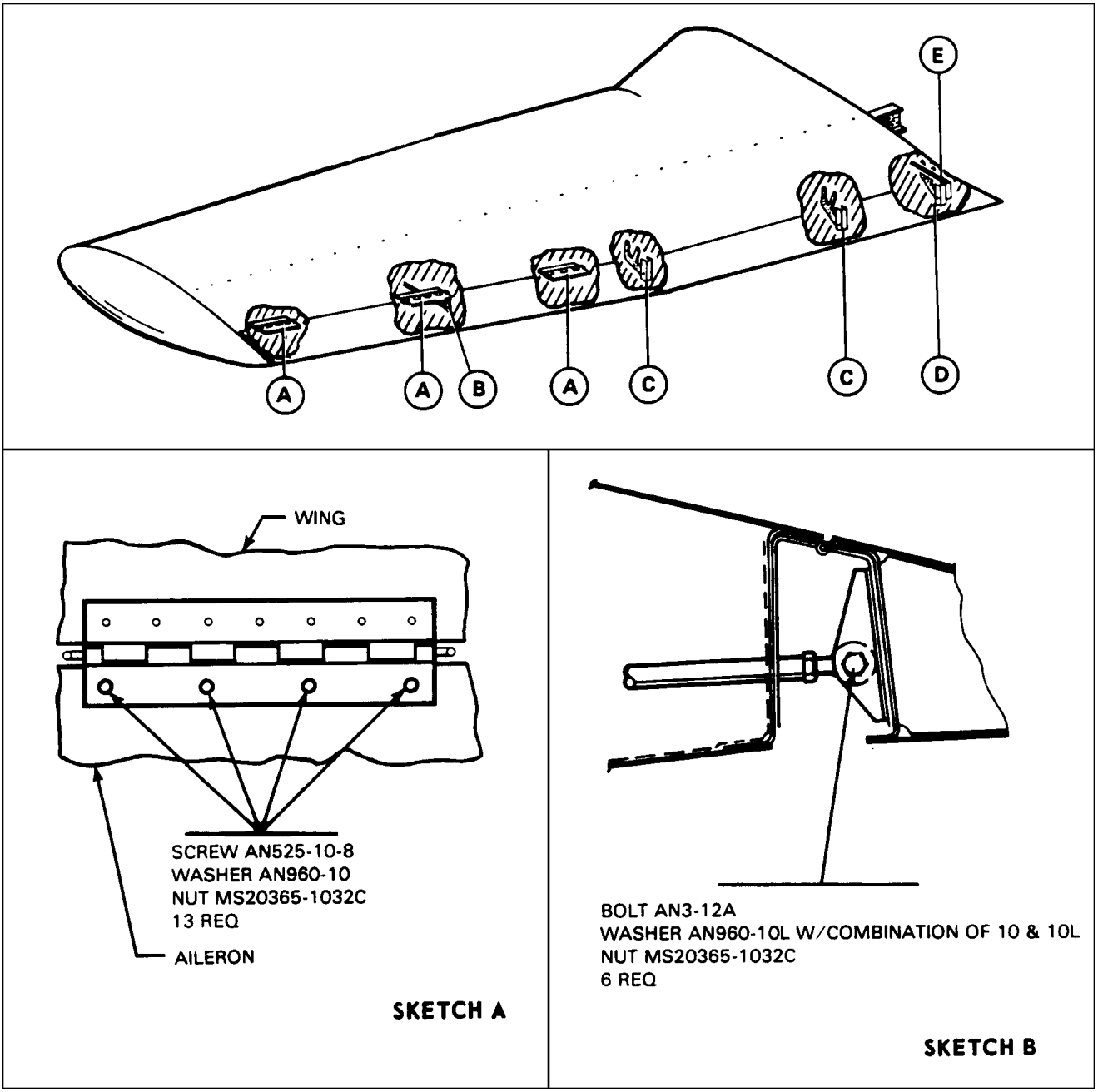


Figure 57-3. Aileron and Flap Installation (Sheet 1 of 2)

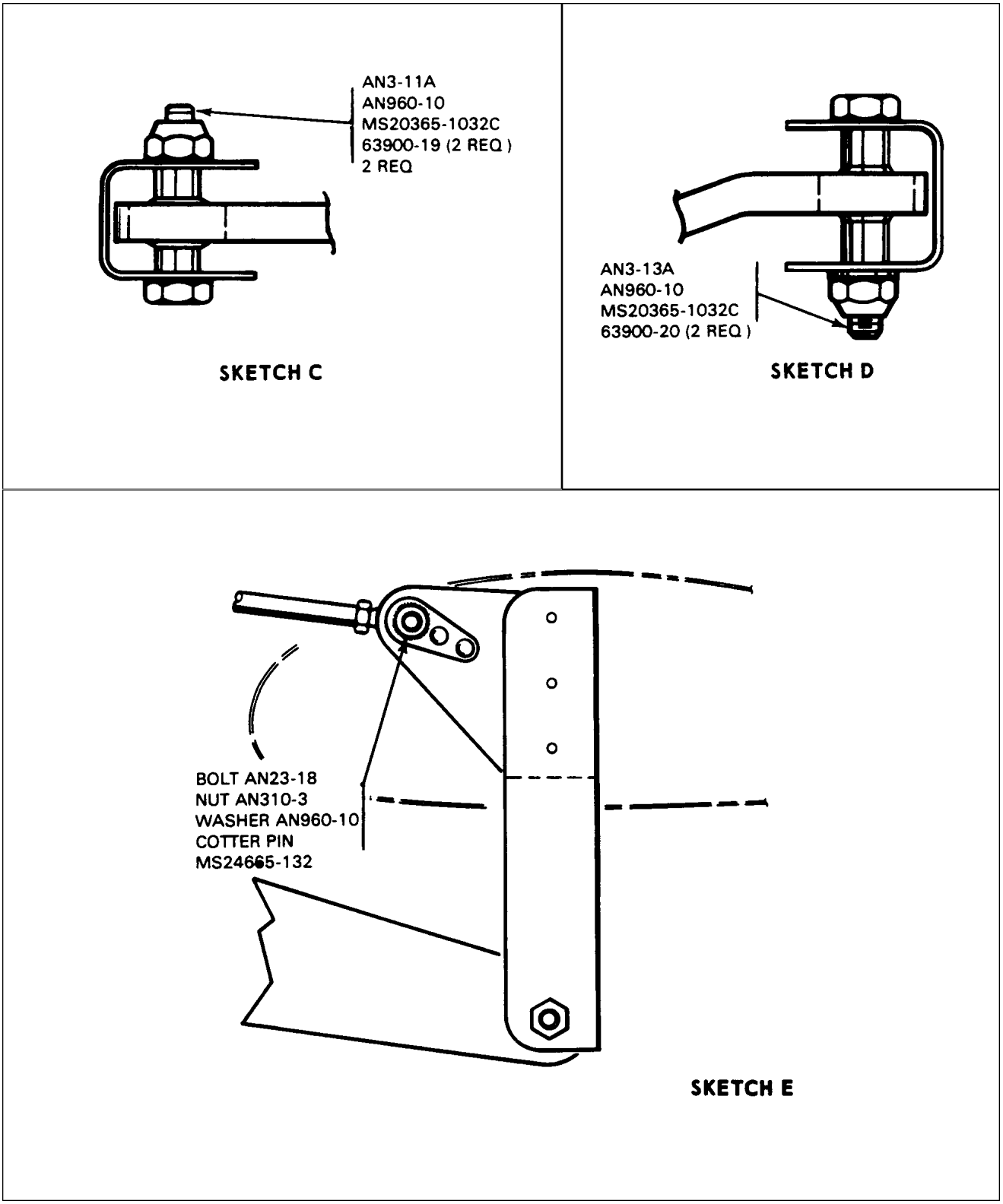
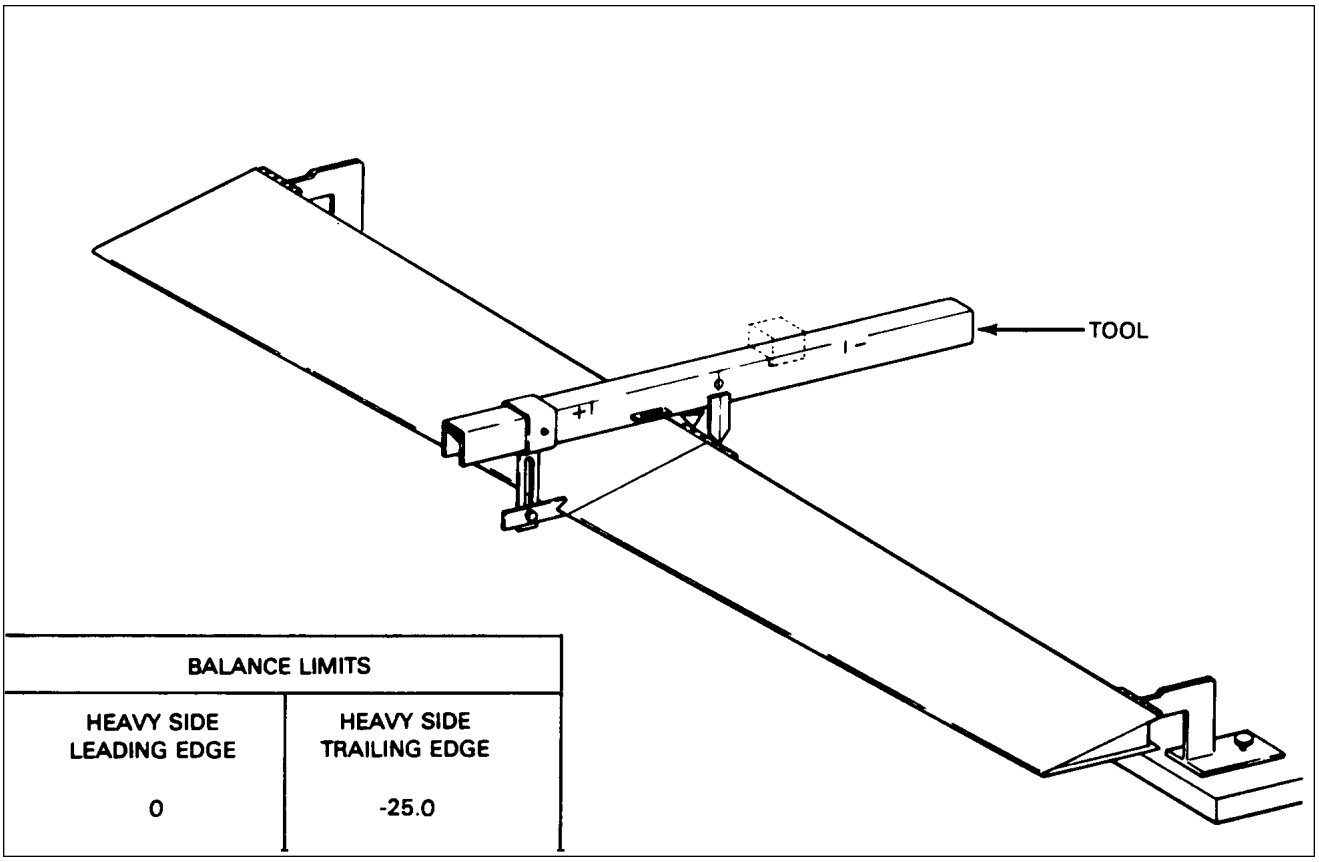


Figure 57-3. Aileron and Flap Installation (Sheet 2 of 2)



BALANCE LIMITS	
HEAVY SIDE LEADING EDGE	HEAVY SIDE TRAILING EDGE
0	-25.0

Figure 57-4. Aileron Balance Configuration

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

Island Enterprises

CHAPTER

61

PROPELLER

3B24

CHAPTER 61 - PROPELLER

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
61-00-00	GENERAL	3C3	
61-10-00	PROPELLER ASSEMBLY	3C4	
61-10-00	Removal of Propeller	3C4	
61-10-00	Archer II	3C4	
61-10-00	Archer III (S/N's 2890206 and up)	3C4	
61-10-00	Cleaning, Inspection and Repair of Propeller	3C4	
61-10-00	Installation of Propeller	3C5	
61-10-00	Archer II	3C5	
61-10-00	Archer III (S/N's 2890206 and up)	3C6	
61-10-00	Blade Track	3C7	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

—WARNING—

It is the user's responsibility to refer to the application vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft .

This chapter gives information on the service and replacement procedures of the propeller assembly.

THIS SPACE INTENTIONALLY LEFT BLANK

PROPELLER ASSEMBLY

A. REMOVAL OF PROPELLER

1. Archer II

a. Ensure master and magneto switches are off.
b. Move fuel selector to off position and place mixture control in idle cut-off.
c. Note position of each component to aid installation.
d. Remove screws attaching spinner assembly and remove spinner.
e. Remove safety wire securing six attaching bolts and remove bolts. Remove propeller.

2. Archer III (S/N's 2890206 and up)

a. Ensure master and magneto switches are off.
b. Move fuel selector to off position and place mixture control in idle cut-off.
c. Note position of each component to aid installation.
d. Remove screws attaching spinner assembly and remove spinner.
e. Remove safety wire securing six attaching bolts and remove bolts.
f. Remove propeller, bulkhead, and spacer. Spacer stays with propeller and bulkhead.

B. CLEANING, INSPECTION AND REPAIR OF PROPELLER

1. Clean spinner, back plate and propeller surfaces with a non-corrosive solvent, and inspect for nicks, scratches, corrosion, and cracks.
2. Nicks in leading edges of blades should be filed out and all edges rounded, as cracks sometimes start from such places. Use fine emery cloth for finishing. (Refer to Figure 61-1 for propeller blade care.) A propeller with severe nicks, scratches, corrosion or cracks should be returned to a propeller overhaul shop or the manufacturer for inspection and repair.
3. Each blade face should be sanded lightly and painted, when necessary, with a flat black paint to retard glare. A light application of oil or wax may be applied to the surfaces to prevent corrosion.

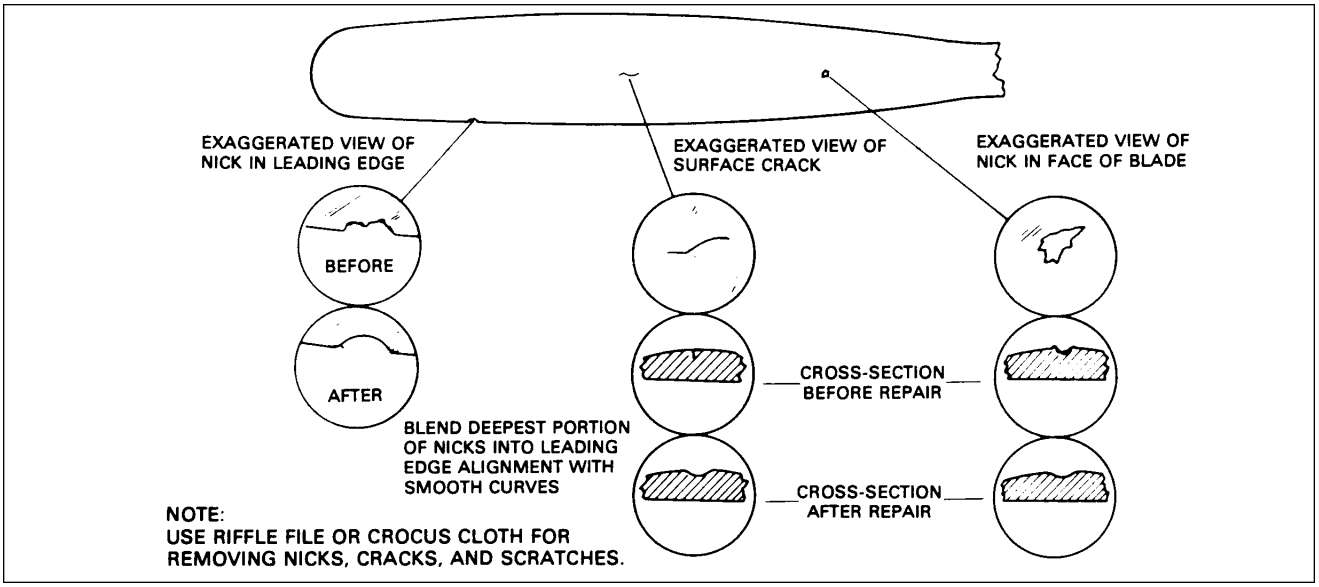

EXAGGERATED VIEW OF NICK IN LEADING EDGE
EXAGGERATED VIEW OF SURFACE CRACK
EXAGGERATED VIEW OF NICK IN FACE OF BLADE
BEFORE
AFTER
CROSS-SECTION BEFORE REPAIR
CROSS-SECTION AFTER REPAIR
BLEND DEEPEST PORTION OF NICKS INTO LEADING EDGE ALIGNMENT WITH SMOOTH CURVES
NOTE:
USE RIFFLE FILE OR CROCUS CLOTH FOR REMOVING NICKS, CRACKS, AND SCRATCHES.

Figure 61-1. Typical Nicks and Removal Method

C. INSTALLATION OF PROPELLER

1. Archer II (Refer to Figure 61-2)

a. Ensure magneto switch is OFF.
b. Place generator or alternator drive belt in groove of starter ring gear and position starter gear on flange of crankshaft. Verify stamped "O" on gear is aligned with "O" on crankshaft flange.
c. Install propeller spinner back plate or bulkhead on starter ring gear.
d. Rotate crank shaft until top center (TC) mark on starter gear and crank case parting flange (or index mark on starter housing) are aligned.
e. Install propeller with tips pointing at two and eight o'clock position.
f. Install and tighten each propeller bolt, with washer, finger tight. Use a torque wrench for final tightening and tighten in sequence so all bolts are pulled down evenly. Tighten one-half inch bolts to a torque of 720 to 780 ***inch***-pounds (60 to 65 ***foot***-pounds).
g. Check propeller blade track. (Refer to paragraph D)
h. Safety propeller mounting bolts with MS20995-C41 wire.
i. Install spinner and tighten cap bolts to a torque of 35 to 40 inch-pounds.
j. Adjust alternator drive belt per Checking Alternator Belt Tension, chapter 24.

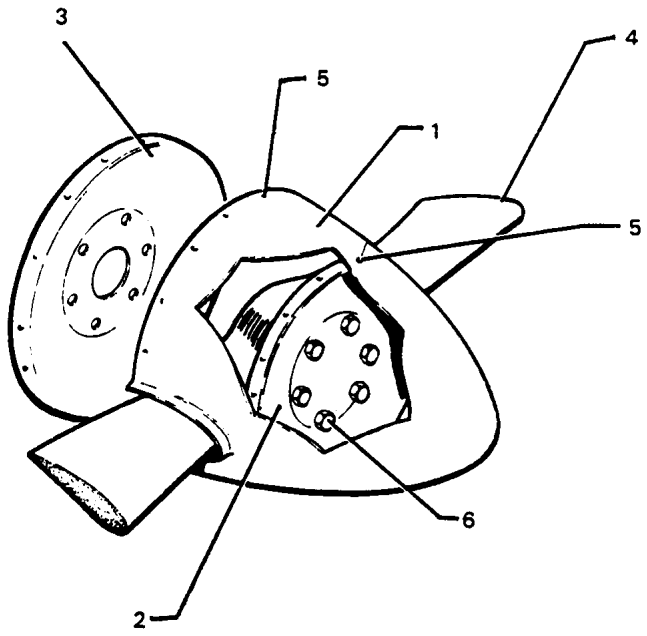
—NOTE—

If propeller - engine combination feels rough on initial run-up or flight, propeller may be rotated 180 degrees from initial installation.

CHART 6101. ARCHER II PROPELLER TORQUE LIMITS

DESCRIPTION	REQUIRED TORQUE
Propeller Mounting Bolts	60-65 Foot Pounds
Forward Bulkhead Attachments Bolts	30-35 Inch-Pounds
Spinner Attachment Screws	20-25 Inch-Pounds

THIS SPACE INTENTIONALLY LEFT BLANK



1. SPINNER - PROPELLER
2. BULKHEAD ASSEMBLY - FRONT
3. BULKHEAD ASSEMBLY - REAR
4. PROPELLER
5. SCREWS
6. BOLT

Figure 61-2. Archer II Propeller Installation

2. Archer III (S/N's 2890206 and up) (Refer to Figure 61-3)

a. Ensure magneto switch is OFF.

b. Place alternator drive belt in groove of starter ring gear and position starter gear on flange of crankshaft. Verify stamped "O" on gear is aligned with "O" on crankshaft flange.

c. Assemble propeller, bulkhead, and spacer as follows:

(1) Insert 6 AN8H-82AS bolts into propeller hub.

(2) Assemble bulkhead to propeller by aligning bolt holes with bolts inserted into propeller hub. Position bulkhead in place over bolts.

— CAUTION —

Each propeller and spacer are drillled as a unit and are NOT interchangable.

(3) Locate spacer over bolts inserted into propeller hub. Be sure the the number 1 stamped on the the spacer lies on the number 1 blade C_L.

d. Install assembled propeller, bulkhead, spacer and bolts by positioning blade number 1 at the zero (0) mark on the engine ring gear, and so that bolts align with bolt holes in ring gear. Insert bolts into ring gear and finger tighten. Use a torque wrench for final tightening and tighten in sequence so all bolts are pulled down evenly. Tighten AN8H-82AS bolts to 60-65 ***foot*** lbs.

—NOTE—

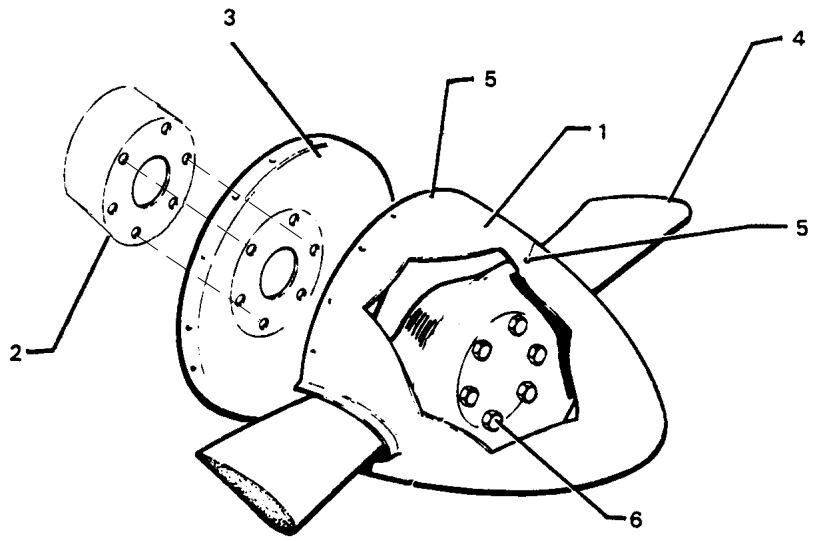
If propeller - engine combination feels rough on initial run-up or flight, propeller may be rotated 180 degrees from initial installation.

g. Check propeller blade track. (Refer to paragraph D)
h. Safety propeller mounting bolts with MS20995-C41 wire.

— NOTE —

Boss on spinner bulkhead may be wrapped with 289 789 Teflon tape (up to 4 layers maximum) in order to obtain a snug fit into bore in propeller.

i. Install spinner. Secure with AN526C1032R8 screws.
j. Adjust alternator drive belt per Checking Alternator Belt Tension, chapter 24.



1. SPINNER - PROPELLER
2. SPACER
3. BULKHEAD ASSEMBLY
4. PROPELLER
5. SCREWS
6. BOLT

Figure 61-3. Archer III Propeller Installation (S/N's 2890206 and up)

D. BLADE TRACK

Blade track is ability of one blade tip to follow other, while rotating, in almost same plane. Excessive difference in blade track (more than 0.0625 inch) indicates bent blades or improper propeller installation. Check blade track as follows:

1. With engine shut down and blades vertical, secure to aircraft a smooth board just under tip of lower blade. Move tip fore and aft through its full blade-shake travel, making small pencil marks at each position. Then center tip between these marks and scribe a line on board for full width of tip.
2. Carefully rotate propeller by hand to bring opposite blade down. Center tip, and scribe a pencil line, and check lines are not separated more than 0.0625 inch.
3. Propellers having excess blade track must be removed and inspected for bent blades. Bent blades require repair and overhaul of assembly.

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

70

STANDARD PRACTICES - ENGINE

3C10

Island Enterprises

CHAPTER 70 - STANSARD PRACTICES - ENGINE

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
70-00-00	STANDARD PRACTICES - ENGINE	3C13	

THIS PAGE INTENTIONALLY LEFT BLANK

STANDARD PRACTICES - ENGINE

Use the following suggestions when working on the power plant.

l. To insure proper reinstallation or assembly, tag and mark all parts, clips, and brackets as to location prior to removal or disassembly.

2. During removal of various tubes or engine parts, inspect them for indications of scoring, burning or other undesirable conditions. To facilitate reinstallation, observe location of each part during removal. Tag any unserviceable part and units for investigation and possible repair.

— CAUTION —

Dust caps used to protect open lines must always be installed OVER tube ends and NOT IN tube ends Flow through lines may be blocked off if lines are installed with dust caps in tube ends.

3. Do not allow foreign matter such as lockwire, washers, nuts, dirt, dust, etc to enter engine. Use suitable protective caps, plugs, and covers to protect all exposed openings.

4. Should any items be dropped into engine, assembly process must stop and item must be removed. Check all parts are thoroughly clean before assembling.

5. Never reuse any lockwire, lock washers, tab locks, tab washers, or cotter pins. All lockwire and cotter pins must fit snugly in holes drilled in studs and bolts for locking purposes. Cotter pins must be installed so head fits into the castellation of the nut, and unless otherwise specified, bend one end of pin back over stud or bolt and other end down flat against nut. Use only corrosion resistant steel lockwire and cotter pins. Bushing plugs shall be lockwired to assembly base or case. Do not lockwire plug to bushing.

6. All gaskets, packings, and rubber parts must be replaced with new items of the same type at assembly. Verify new nonmetallic parts to be installed show no sign of having deteriorated in storage.

7. When installing engine parts which require use of a hammer, use only a plastic or rawhide hammer.

— CAUTION —

Apply anti-seize compounds in thin even coats, and completely remove excess compound to avoid contamination of adjacent parts.

8. Anti-seize lubrication must be applied to all loose-fit spline drives, which are external to engine and have no other means of lubrication. For certain assembly procedures, use molybdenum disulfide in paste or powdered form mixed with engine oil or grease.

9. Temporary marking methods are those markings which will insure identification during ordinary handling storage, and final assembly of parts.

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

71

POWER PLANT

3C15

CHAPTER 71 - POWER PLANT

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
71-00-00	POWER PLANT	3C18	
71-00-00	General	3C18	
71-00-00	Description	3C18	
71-00-00	Troubleshooting	3C19	
71-00-00	Static Rpm Determination	3C24	
71-00-00	Static Rpm Test Procedure	3C24	
71-00-00	Scope	3C24	
71-00-00	Equipment	3C24	
71-00-00	Simplified Test Procedure	3D1	
71-00-00	Expanded Test Procedure	3D1	
71-00-00	Test Results	3D2	
71-00-00	Removal of Engine	3D7	
71-00-00	Installation of Engine	3D8	
71-10-00	COWLING	3D14	
71-10-00	Maintenance of Cowling	3D14	
71-10-00	Removal of Cowling	3D14	
71-10-00	Archer II	3D14	
71-10-00	Archer III - S/N's 2890206 an up	3D14	
71-10-00	Cleaning, Inspection and Repair of Cowling	3D16	
71-10-00	Installation of Cowling	3D16	
71-10-00	Archer II	3D16	
71-10-00	Archer III - S/N's 2890206 an up	3D16	
71-60-00	AIR INTAKES	3D20	
71-60-00	Carburetor Ice Detector	3D20	
71-60-00	General	3D20	
71-60-00	Troubleshooting	3D20	
71-60-00	Functional Check of Ice Detector Probe	3D20	
71-60-00	Removal of Ice Detector Probe	3D21	
71-60-00	Installation of Ice Detector Probe	3D21	

THIS PAGE INTENTIONALLY LEFT BLANK

POWER PLANT

A. GENERAL

This section covers the power plant used in the PA-28-181 ARCHER airplane, and is comprised of instructions for the removal and installation, minor repairs and service of the propeller, engine, induction system components, ignition system components and engine lubrication system.

For further instructions and for major repairs, consult the appropriate publications of the engine or component manufacturer.

B DESCRIPTION AND OPERATION

Both the PA-28-181 ARCHER II and ARCHER III are powered by an Textron-Lycoming engine, of 180 horsepower (Refer to Power Plant Specifications in 6-10-00, Chart 601.) The engine is an 0-360 series, four cylinder, wet sump, horizontally opposed, direct drive, air cooled power plant. The cylinders are not directly opposed from each other but are staggered, thus permitting a separate throw on the crankshaft for each connecting rod.

The induction system on this engine consists of a wet type air filter, a Marvel-Schebler float type carburetor and a diaphragm type fuel pump.

The engines on both models incorporate a fuel priming system for cold engine starting. The ARCHER II has a manual pump type primer system, while the primer system on the ARCHER III is electric.

The magneto used on the ARCHER II engine may be either Bendix S4LN series, Slick 4000 series or Slick 4200 series. The Slick 4000 series magnetos are installed with their associated components. (Refer to Power Plant Specifications in 6-10-00, Chart 601 for particulars.) The ARCHER III is equipped with Slick 4370 (RH) and 4371 (LH) magnetos. These magnetos are engineered to give trouble free ignition, and are exchanged for factory rebuilt units upon engine overhaul, for a nominal cost. These magnetos are non-serviceable units. The 4200 or 4300 series magnetos are completely self contained and consist of impulse coupling on the left magneto to aid in starting. These magnetos are serviceable units.

In addition to the previously mentioned components, each ARCHER II engine is furnished with a starter, 60 ampere alternator, 14 volt electrical system, shielded ignition, vacuum pump drive and fuel pump. The exhaust system is stainless steel with two mufflers. A shroud is provided to supply heat for both the cabin and carburetor. Except for being equipped with a 70 amp alternator, 28 volt electrical system, the ARCHER III engine is furnished the same as the Archer II.

The lubrication system is the pressure wet sump type. The oil pump is located in the accessory housing and draws oil through a drilled passage leading from the oil suction screen located in the sump. The oil from the pump then enters a drilled passage in the accessory housing, which feeds the oil to a threaded connection on the rear face of the accessory housing, where a flexible line leads the oil to the external oil cooler. Pressure oil from the cooler returns to a second threaded connection on the accessory housing from which point a drilled passage conducts the oil through the pressure screen or filter. In the event that cold oil or an obstruction should restrict the flow of oil to the cooler, an oil bypass also is provided to pass the oil directly from the oil pump to the oil pressure screen or filter.

The oil pressure screen or filter element, located on the accessory housing is provided as a means to filter any solid particles from the oil that may have passed through the suction screen in the sump. After being filtered, the oil is fed through a drilled passage to the oil pressure relief valve, located in the upper right side of the crankcase in front of the accessory housing. This relief valve regulates the engine oil pressure by allowing excess oil to return to the sump while the balance of the pressure oil is fed to the main oil gallery in the right half of the crankcase. Residual oil is returned by gravity to the sump where, after passing through the suction screen in the sump, it is again circulated through the engine.

C. TROUBLESHOOTING (FAULT ISOLATION)

Troubles peculiar to the power plant are listed in Chart 7101 along with their probable cause and suggested remedies. When troubleshooting the engine, ground the magneto primary circuit before performing any checks on the engine.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 1 of 6)

Fault	Cause	Remedy
Failure of engine to start.	Lack of fuel.	Check fuel system for leaks. Fill fuel tank. Clean dirty lines, strainers, or fuel valves.
	Under priming.	Prime with two or three strokes of primer (Archer II). Toggle primer switch for 1 or 2 seconds (Archer III).
	Over priming.	Leave igniton OFF and mixture control in IDLE CUT-OFF. Open throttle and crank engine for a few seconds. Turn ignition ON and continue with normal start.
	Incorrect throttle setting.	Open throttle to one-tenth of its range.
	Defective spark plugs.	Clean and adjust or replace spark plug or plugs. Refer to 6-10-00, Chart 601 for spark plug gap adjustments.
	Defective ignition wire.	Check with electric tester and replace any defective wires.
	Improper operation of magneto breaker.	Check timing of magnetos.
	Internal failure.	Check oil sump screen for metal particles. If found, complete overhaul of the engine may be indicated.
	Improper switch wiring for left magneto starting.	Reverse magneto switch wires.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 2 of 6)

Fault	Cause	Remedy
Failure of engine to start. (cont.)	Magnetized impulse coupling	Demagnetize impulse couplings (left magneto only).
	Frozen spark plug electrodes.	Replace spark plugs or dry out removed plugs.
	Defective battery.	Replace with charged battery.
	Lack of sufficient fuel flow.	Disconnect fuel line and check fuel flow.
	Water in carburetor.	Drain carburetor and fuel lines.
	Mixture control in idle cut-off.	Open mixture control.
Failure of engine to idle properly.	Shorted ignition switch or loose ground	Check and replace or repair.
	Incorrect carburetor idle adjustment.	Adjust throttle stop to obtain correct idle.
	Idle mixture.	Adjust mixture. Refer to engine manufacturer's handbook for proper procedure.
	Leak in the induction system.	Tighten all connections in the induction system. Replace any defective parts.
	Uneven cylinder compression.	Check condition of piston rings and valve seats.
	Faulty ignition system.	Check entire ignition system.
	Open primer.	Lock primer.
	Improper spark plug setting for altitude.	Check spark plug gap.
	Dirty air filter.	Clean or replace.
Low power and uneven running engine.	Insufficient fuel pressure.	Adjust fuel pressure.
	Mixture too rich; indicated by sluggish engine operation, red exhaust flame and black smoke.	Check primer. Adjustment of carburetor indicated.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 3 of 6)

Fault	Cause	Remedy
Low power and uneven running engine. (cont.)	Mixture too lean; indicated by overheating or backfiring.	Check fuel lines for dirt or other restrictions. Check fuel supply.
	Leaks in induction system.	Tighten all connections. Replace defective parts.
	Defective spark plugs.	Clean and adjust or replace spark plug.
	Excessive blow-by.	Usually caused by weak or stuck rings. Overhaul.
	Improper engine operation.	Check entire engine.
	Improper grade of fuel.	Fill tank with recommended grade.
	Magneto breaker points not working properly .	Clean points. Check internal timing of magneto.
	Defective ignition wire.	Check wire with electric tester. Replace defective wire.
	Defective spark plug terminal connectors.	Replace connectors on spark plug wire.
	Restriction in exhaust system.	Check for loose muffler baffles.
	Improper ignition timing.	Check magnetos for timing and synchronization
Failure of engine to develop full power.	Throttle lever out of adjustment.	Adjust throttle lever.
	Leak in induction system.	Tighten all connections, and replace defective parts.
	Restriction in carburetor air scoop.	Examine air scoop and remove restriction.
	Improper fuel.	Fill tank with recommended fuel.
	Faulty ignition.	Tighten all connections. Check system. Check ignition timing.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 4 of 6)

Fault	Cause	Remedy
Failure of engine to develop full power. (cont.)	Carburetor heat ON or leaking.	Select carburetor heart OFF or adjust.
	Improper fuel flow.	Check fuel strainer, gauge and flow at inlet.
Rough running engine.	Cracked engine mounts.	Repair or replace engine mount.
	Defective mounting bushings.	Install new mounting bushings.
	Unbalanced propeller.	Remove propeller and have it checked for balance.
	Bent propeller blades.	Check propeller for blade track.
	Lead deposit on spark plug.	Clean or replace plugs.
	Malfunctioning engine.	Check entire engine.
	Uneven compression.	Check compression
Low oil pressure.	Insufficient oil.	Check oil supply.
	Dirty oil screens.	Remove and clean oil screens.
	Defective pressure gauge.	Replace gauge.
	Air lock or dirt in relief valve.	Remove and clean oil pressure relief valve.
	Leak in suction line or pressure line.	Check gasket between accessory housing crankcase.
	High oil temperature.	See “High Oil Temperature” in Fault Column.
	Stoppage in oil pump intake passage.	Check line for obstruction. Clean suction screen.
	Worn or scored bearings.	Overhaul engine.
High oil temperature.	Insufficient air cooling.	Check air inlet and outlet for deformation or obstruction.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 5 of 6)

Fault	Cause	Remedy
High oil temperature. (cont.)	Insufficient oil supply.	Fill oil sump to proper level.
	Clogged oil lines or screens.	Remove and clean oil screens.
	Failing or failed bearing.	Examine sump for metal particles and, if found, overhaul engine.
	Defective thermostats.	Replace.
	Improper grade of oil.	Replace with oil conforming to specifications.
	Defective temperature gauge.	Replace gauge.
	Excessive blowby.	Usually caused by weak or stuck rings. Overhaul engine.
	Improper engine operation.	Check entire engine.
Excessive oil consumption.	Failing or failed bearing.	Check sump for metal particles and, if found, overhaul engine.
	Failure of rings to seat.	Use mineral base oil. Climb to cruise altitude at full power and operate at 75% cruise power setting until oil consumption stabilizes.
	Worn or broken piston rings.	Install new rings.
	Incorrect installation of piston rings.	Install new rings.
	External oil leakage.	Check engine carefully for leaking gaskets, O-rings, or sand holes.
	Leakage through engine fuel pump vent.	Replace fuel pump O-ring.
	Leakage through engine breather or vacuum pump breather.	Check engine and overhaul or replace vacuum pump.

CHART 7101. ENGINE FAULT ISOLATION (Sheet 6 of 6)

Fault	Cause	Remedy
Excessive oil consumption. (cont.)	Improper grade of oil.	Replace with oil conforming to specifications.
Overpriming.	Cold weather.	Leave igniton OFF and mixture control in IDLE CUT-OFF. Open throttle and crank engine for a few seconds. Turn ignition ON and continue with normal start.
Inaccurate pressure readings.	Cold weather.	High or low pressure readings due to extremely cold weather are not necessarily a malfunction. Small and long oil lines will not transfer pressure readings accurately until engine is warm.

D. STATIC RPM DETERMINATION.

1. Static Rpm Test Procedure.

The maximum static rpm value for a fixed pitch propeller equipped aircraft provides an indication that the engine/propeller combination is meeting rated power output.

Low static rpm indicates a low engine power or incorrect propeller (higher pitch/longer diameter) while a high rpm indicates high engine power or incorrect propeller (lower pitch/shorter diameter), any of which is not desirable. For this reason it is important that each propeller combination meets the criteria of this section. However, many factors influence engine power and therefore the actual static rpm can change significantly. This section provides a procedure whereby accurate and repeatable static rpm values may be obtained.

2. Scope.

This section describes the ground test procedure for determining the maximum static rpm value for each fixed pitched propeller aircraft listed in Chart 7102, Propeller Applicability.

3. Equipment.

a. The following equipment is required to accomplish this ground test procedure:

(1) Vu-thru tachometer
(2) Instrument or means to obtain outside air temperature and relative humidity or dew point. The following list of instruments may be used, but are not the only means:
  (a) Automatic Terminal Information Service (ATIS).
  (b) Calibrated Thermometer.

(c) Calibrated Psychrometer.
(d) National Weather Service.
(e) Omega Hand Held Hygrometers, Models RH-201 and RH-30 or Equivalent.

4. Test Procedure.

A simplified test procedure is provided to test static rpm under limited conditions. In the event that the test conditions do not fall within the limits of Chart 7103 , proceed to the expanded test procedure.

5. SIimplified Test Procedure.

a. Obtain ambient outside air temperature and dew point.
b. Head aircraft into the wind.
c. Apply full throttle. Avoid prolong runs at full power.
d. Allow oil temperature to reach 180±10 degrees.
e. Record the test static rpm using the Vu-thru tachometer

— NOTE —

If wind speed exceeds 10 knots record static rpm and oil tem - perature into the wind, left crosswind, downwind, and right crosswind. Average the four test static RPM values.

f. Using the outside air temperature and dew point enter Chart 7103 and read the corresponding BASELINE rpm value. With baseline value and tested static rpm, proceed to Step 7 Test Results.

— NOTE —

Use the temperature and dew point values on Table 7103 which most closely correspond to the test condition. Interpolate baseline rpm if temperature and/or dew point fall equally between two or more blocks.

6. Expanded Test Procedure.

The worksheet found on the following page should be copied and the copy used to document the following expanded test procedure.

a. Obtain ambient outside air temperature and relative humidity.

— NOTE —

Relative humidity may be obtained using a psychrometric chart (reference Table 7103) if the outside air temperature, and dew point, or wet bulb are known.

b. Head aircraft into the wind.
c. Apply full throttle. Avoid prolonged runs at full power.
d. Allow oil temperature to reach at least 80 degrees F.
e. Record the test static rpm using the Vu-thru tachometer and engine oil temperature.

— NOTE —

If wind speed exceeds 10 knots record static rpm and oil tem -

perature into the wind, left crosswind, downwind, and right crosswind. Average the four test static rpm values.

f. With OAT and relative humidity, read static rpm from Figure 71-1.
g. With the oil temperature and OAT, read delta rpm from Figure 71-2.
h. Subtract the delta rpm obtained from Figure 71-2, from the static rpm obtained from Figure 71-1. This is the BASELINE.

7. Test Results.

The tested static rpm from the Vu-thru tachometer shall be within the tolerance specified in Chart 7102 of the BASELINE static rpm

CHART 7102. PROPELLER APPLICABILITY

Propeller	Tolerance of BASELINE
76EM8S5-0-62	+/- 50 RPM
76EM8S14-0-62	+/- 50 RPM

THIS SPACE INTENTIONALLY LEFT BLANK

STATIC RPM WORKSHEET

Aircraft Model: _____

Aircraft S/N: _____

Date: _____

OAT: _____

Relative Humidity (Temp____) (Dew PT____) _____%

Wind above 10 Knots

Tested

Static RPM: _____ Average

Oil Temp: _____

Rpm: _____ (Reference Figure 71-1)

Delta rpm (subtract) _____ (Reference Figure 71-2)

BASELINE Static rpm _____

Tested _____

Static rpm: _____

Result to be within tolerance _____ (Reference Chart 7102)

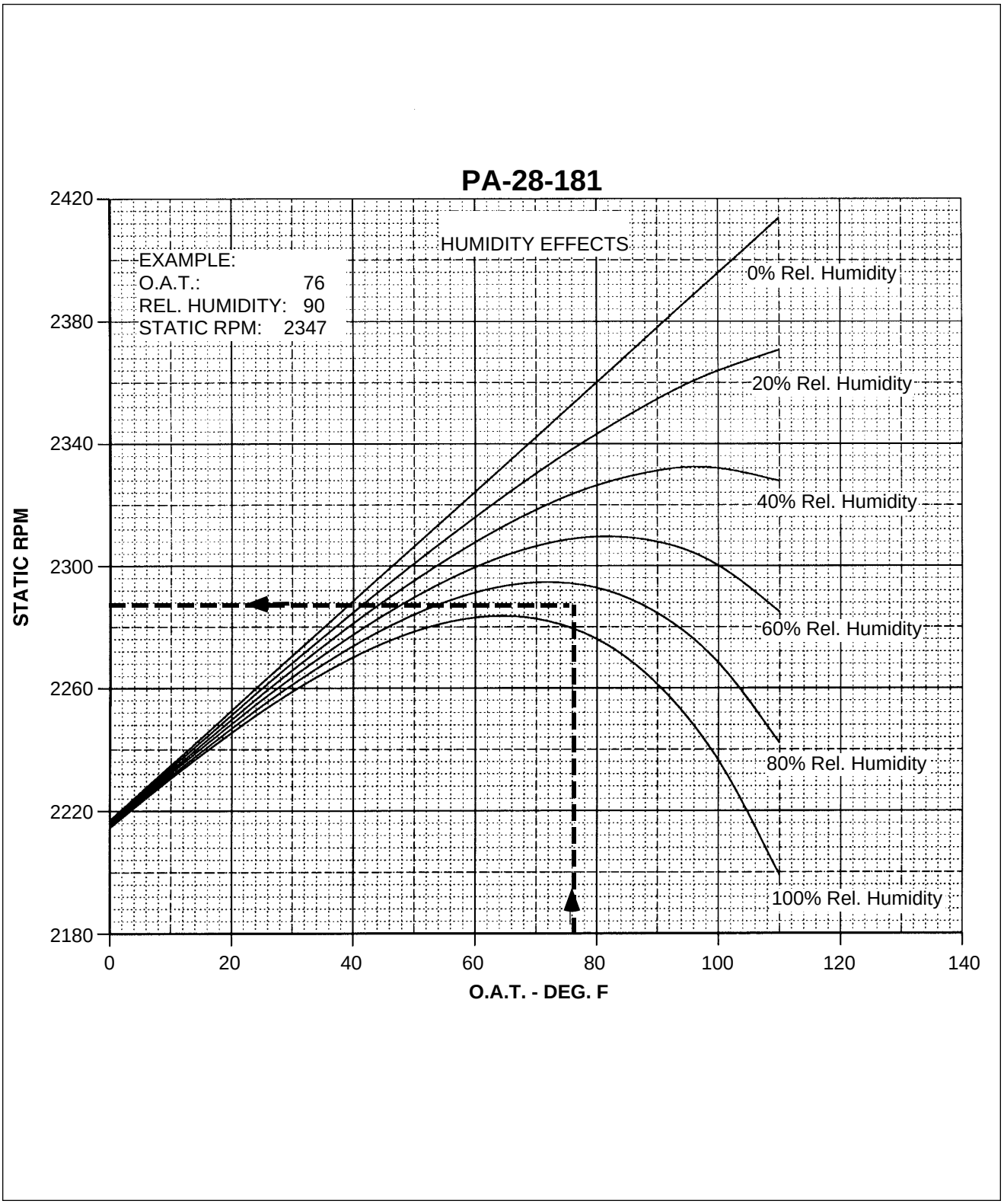


Figure 71-1. Static Rpm (Sea Level ± 500 Feet Pressure Altitude Only)

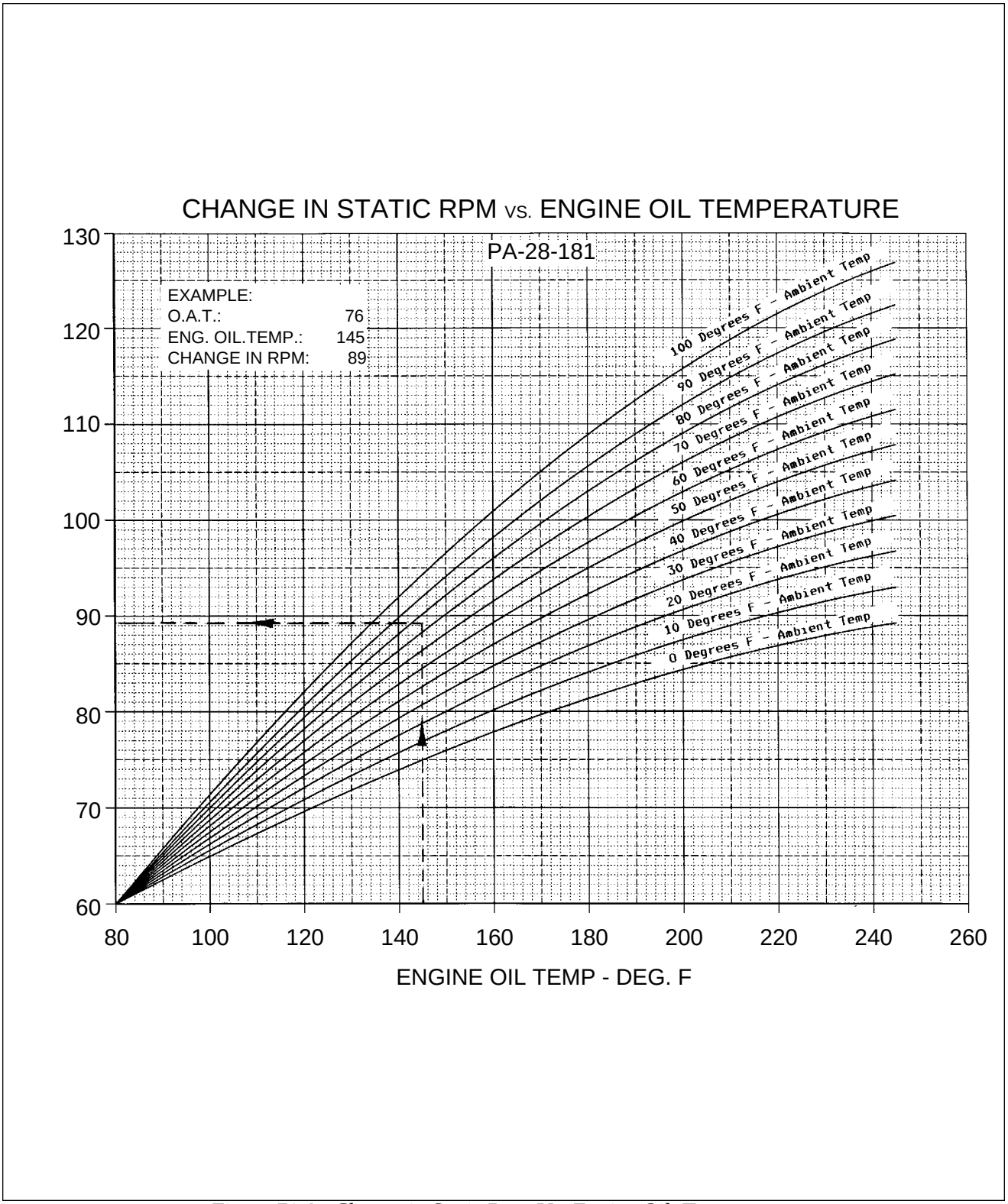


Figure 71-2. Change in Static Rpm Vs. Engine Oil Temperature

PSYCHROMETRIC CHART
FOR
STANDARD SEA LEVEL BAROMETRIC PRESSURE

EXAMPLE:

O.A.T. (Dry Bulb): 75.5
Wet Bulb: 62.5
Dew Point: 56
Rel. Humidity: 50%

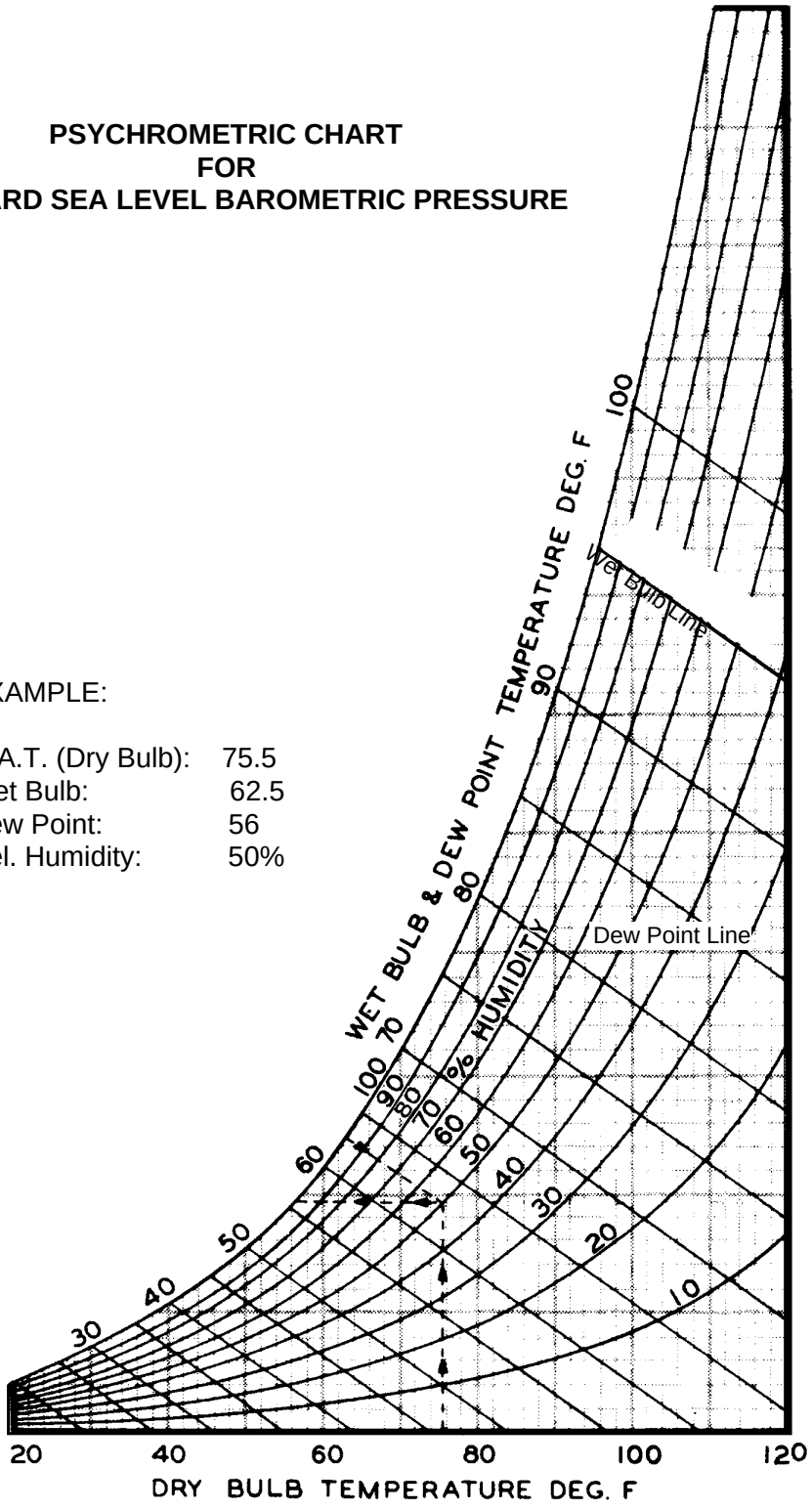


Figure 71-3. Psychrometric Chart

CHART 7103. STATIC RPM WITH **76EM8S5-0-62** OR **76EM8S14-0-62** PROPELLERS

BASELINE RPM (TYP)
DEW POINT (TYP)
TEMP

TEMP									
40	2240 40	2240 36	2240 33	2240 30	2250 26	2250 23	2250 21	2250 17	2250 12
50	2240 50	2250 46	2250 43	2250 39	2250 35	2260 31	2260 27	2260 21	2270 16
60	2250 60	2250 56	2250 53	2260 50	2260 45	2270 41	2270 34	2270 28	2280 21
70	2240 70	2250 67	2250 63	2260 60	2270 55	2270 50	2280 44	2280 36	2290 27
80	2230 80	2240 76	2250 73	2260 68	2270 65	2280 60	2280 53	2290 45	2300 33
85	2230 85	2240 81	2250 77	2260 73	2270 69	2280 65	2290 58	2300 50	2310 40
90	2220 90	2230 86	2240 83	2250 78	2260 74	2270 69	2290 63	2300 55	2310 43
95	2200 95	2220 91	2230 87	2240 83	2260 78	2270 73	2290 67	2300 59	2310 47
100	2190 100	2200 96	2220 93	2240 88	2250 84	2270 78	2280 72	2300 64	2320 52

NOTE: Temperature and Dew Point in Degrees F.

E REMOVAL OF ENGINE. (Refer to Figures 71-1 and 71-2.)

— CAUTION —

Place a tail stand under airplane tail before removing engine.

1. Turn off all electrical switches in cockpit, then disconnect battery ground wire at battery.
2. Move fuel selector lever in cockpit to OFF position.

— CAUTION —

Be sure all electrical leads are disconnected before removing cowling.

3. Remove engine cowlings by releasing cowling fasteners or attachment screws.
4. Remove propeller. (Refer to chapter 61.)
5. Disconnect starter positive and ground leads at starter and their attachment clamps.

6. Disconnect cabin heat and defroster tubes from muffler.
7. Disconnect primer line at tee connection.
8. Disconnect throttle and mixture cables at carburetor and carburetor heat control. Remove carburetor if necessary.
9. Disconnect mechanical fuel pump supply line at pump.
10. Disconnect engine oil cooler lines from cooler.
11. Disconnect magneto P leads at magnetos. lnsert protective cover over connection.
12. Disconnect engine oil temperature lead at aft end of engine.
13. Disconnect tachometer drive cable from rear of engine.
14. Untie ignition harness, hoses, and lines at aft end of engine.
15. Disconnect vacuum pump lines at pump.
16. Disconnect oil pressure line from rear of engine.
17. Disconnect generator or alternator leads and cable attachment clamps.
18. Attach a 1/2 ton (minimum) hoist to hoisting straps and relieve tension from mounts.
19. Check engine for any attachments remaining to obstruct removal.
20. Drain engine oil, if needed, and close drain.
21. Remove the four engine mount assemblies and swing engine free, being careful not to damage any attaching parts.

D. INSTALLATION OF ENGINE. (Refer to Figures 71-1 and 71-2.)

l. Attach a 1/2 ton (minimum) hoist to engine hoisting straps and swing engine into alignment with its attaching points on the mounts.
2. Insert an engine mount bolt through the hole of a mount attachment point (a washer is installed next to bolt head) and slide half of shock mount assembly on bolt. Repeat for other three mounts.
3. Position the engine mounting lugs to align with engine mount attaching points, then move engine rearward onto mounts.
4. Slide onto each mounting bolt a spacerwasher, spacer, and forward half of mount. Install washer and nut, and tighten nuts to a torque of 450 to 500 inch-pounds plus friction drag torque. (Refer to chart 9l02 for information on determining friction drag torque.)
5. Connect alternator leads and secure cables with clamps.
6. Connect oil pressure line, tachometer drive cable, oil temperature lead, and engine vent tube to aft end of engine.
7. Connect vacuum pump line at pump.
8. Secure ignition harness, hoses, and lines at aft end of engine using koroseal lacing.
9. Connect both lines to oil cooler.
10. Connect mechanical fuel pump supply line at pump.
11. Connect magneto P leads to magnetos.
12. Connect throttle, mixture, and carburetor heat cables at engine components.
13. Connect cabin heat and defroster tubes to muffer.
14. Connect starter positive and ground leads at starter and secure with attachment clamps.
15. Verify magneto switches are OFF and install propeller. (Refer to chapter 61.)

— NOTE —

Add Avco-Lycoming oil additive P/N LW-16702 per latest revi - sion Lycoming Service Instruction 1014.

16. Install proper grade and amount of engine oil. (Refer to Lubrication Chart. Chapter 12.)

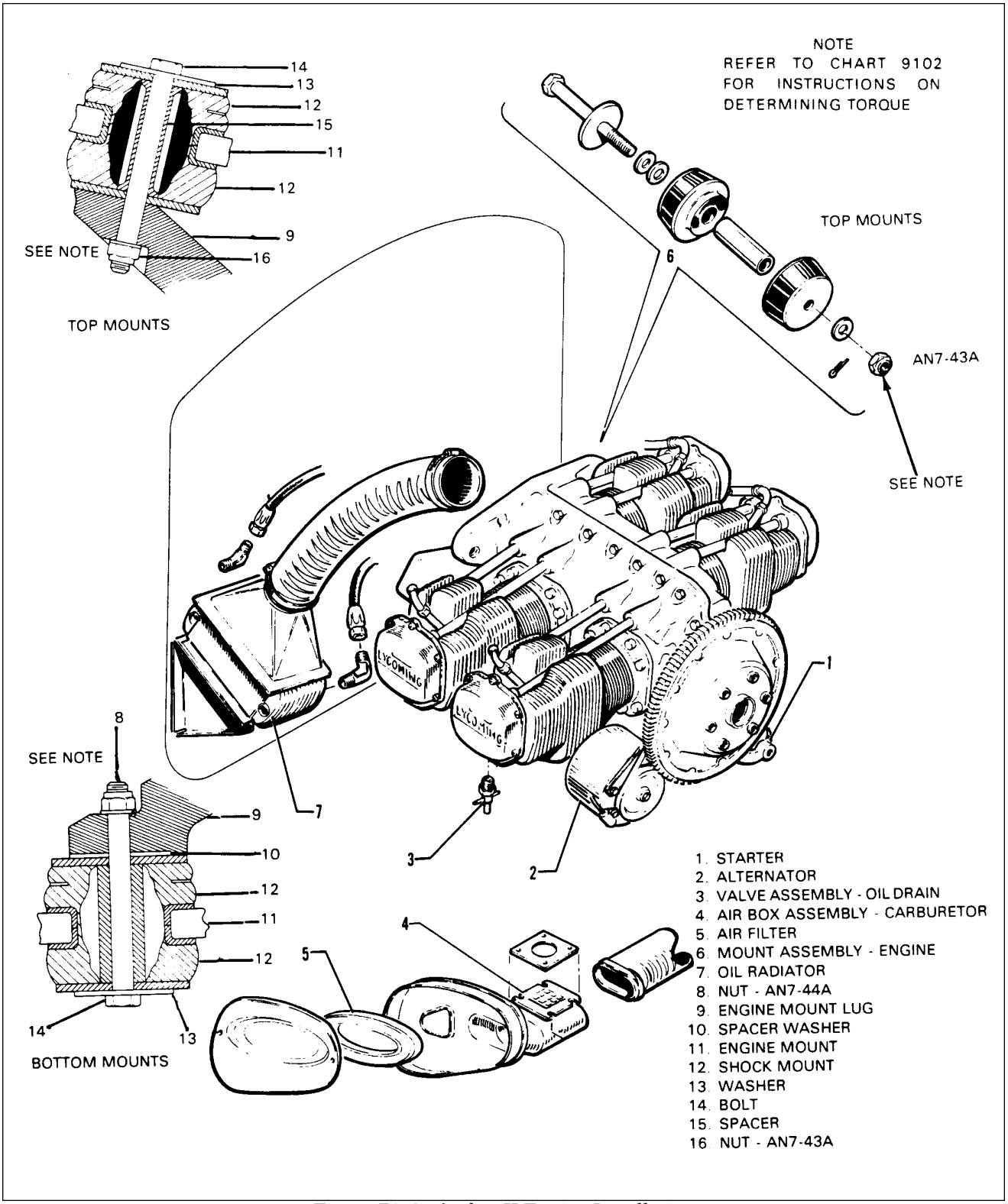


Figure 71-4. Archer II Engine Installation

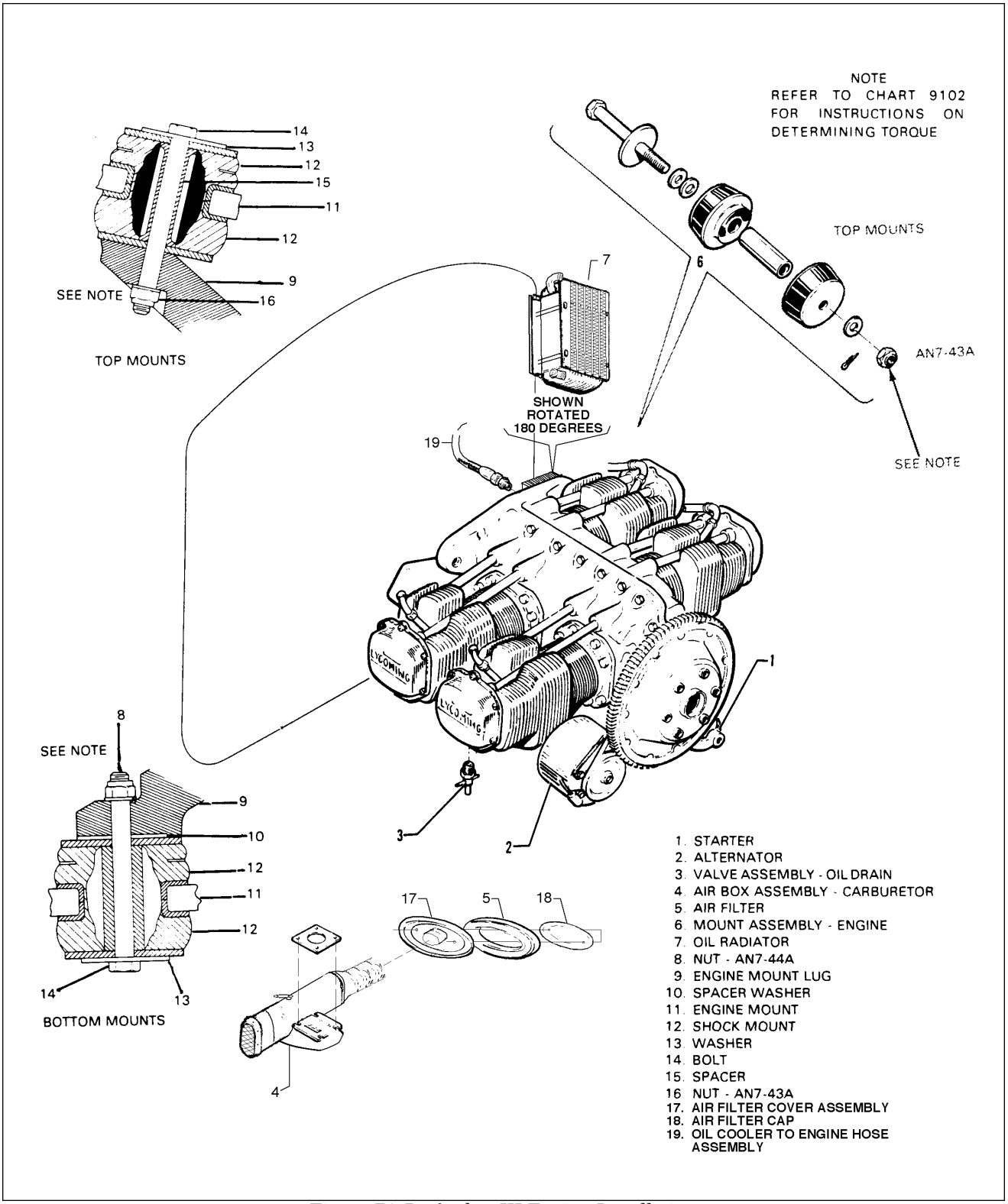


Figure 71-5. Archer III Engine Installation

17. Connect battery ground wire at battery.
18. Open throttle and fuel valve completely. Turn on electric fuel pump and check fuel line for leaks.
19. Install engine cowlings and remove tail stand.

— CAUTION —

To avoid possible high speed bearing failure due to lack of lubrication during initial starts after engine installation, refer to latest revision Lycoming Service Instruction No. 1241 for instructions prior to initial engine lubrication.

20. Perform an engine operational check. Refer to engine manufacturer's appropriate operator's manual.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

COWLING

MAINTENANCE OF COWLING

A. Removal of Cowling

1. Archer II. (Refer to Figure 7l-6.)

a. Release fasteners, two on each side and two at top of cowling.
b. Lift aft end of top cowling and slide it forward to release two stud type front fasteners. Remove top cowling.
c. Disconnect electrical lead to landing light at quick disconnect at right inside of bottom cowling.
d. Disconnect induction air hose at filter housing from bottom of cowling and strut fairing.
e. Remove bottom cowling attaching screws from aft end and remove cowling.

2. Archer III - S/N's 2890206 and up. (Refer to Figure 7l-7.)

a. Remove the two machine screws on both sides of propeller shaft opening.
b. Remove the studs securing the upper cowling to the cowl channel assembly (6 on each side of the cowl).
c. Remove the upper cowling by raising rear edge and pulling slightly aft.
d. To remove lower cowl:
   (1) Remove nose wheel strut fairing by:
      (a) Remove the two machine screws installed sideways through each side of both sections of the fairing.
      (b) Remove the forward section of fairing by removing the 5 screws securing it to the cowl.
      (c) Remove aft fairing section by removing the four remaining machine screws.
      (d) ***Do not remove cowl attachment machine screw located under nose wheel fairing at this time.***
   (2) Loosen hose clamps securing the alternator ventilating air and the cabin air hoses to inlet ducts. Remove both hoses.
   (3) Remove the top 5 machine screws along each aft edge of the lower cowl. ***Do not remove the sixth attachment machine screw, located on bottom aft edge of lower cowl, at this time.***

— NOTE —

With the 5 top machine screws removed, there should be enough "give" in lower cowl to loosen carburetor air box hose clamp from filter cover.

   (4) Loosen carburetor air box hose clamp. Remove hose.

— NOTE —

It is easier to complete lower cowl removal with two people.

   (5) Supporting lower cowl assembly, remove the two machine screws on bottom aft edge of cowl and the forward attachment screw located under nose strut fairing.
   (6) Carefully lower and remove lower cowl assembly.

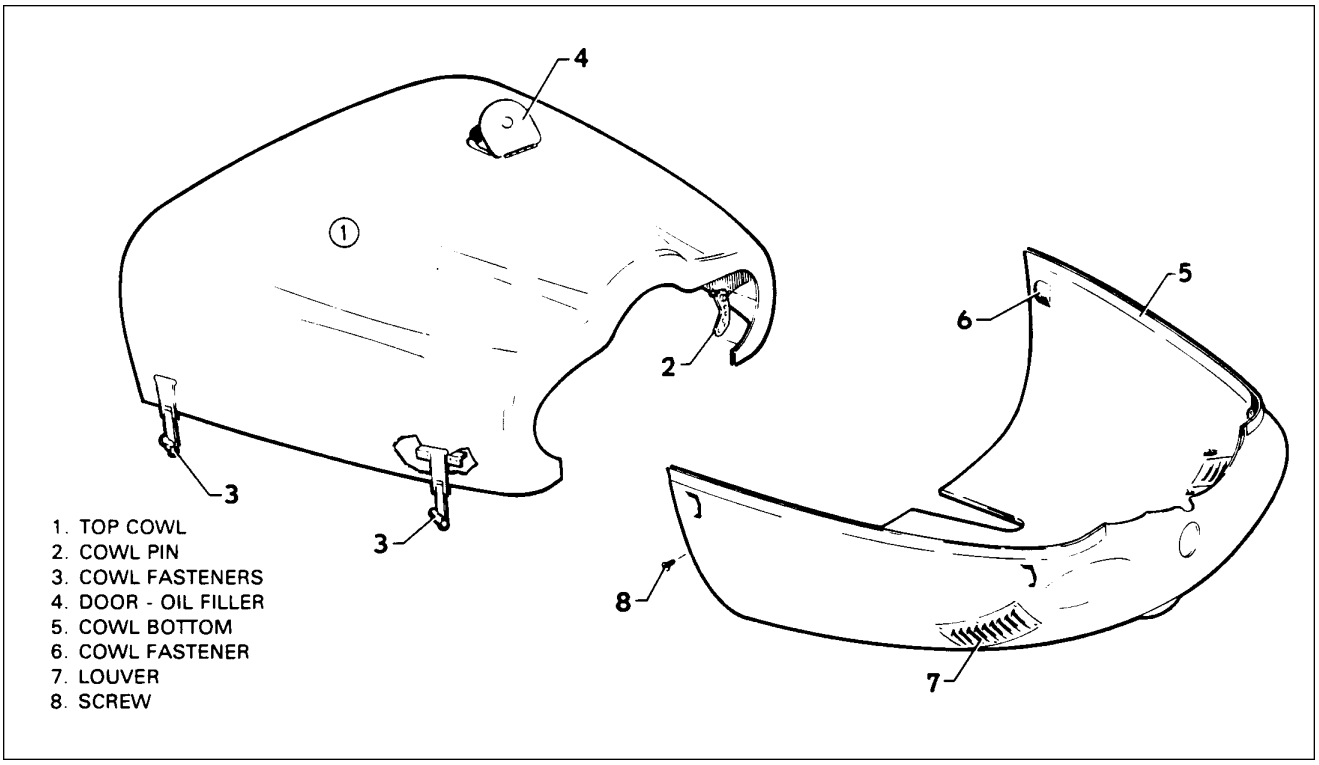


Figure 71-6. Archer II Cowling

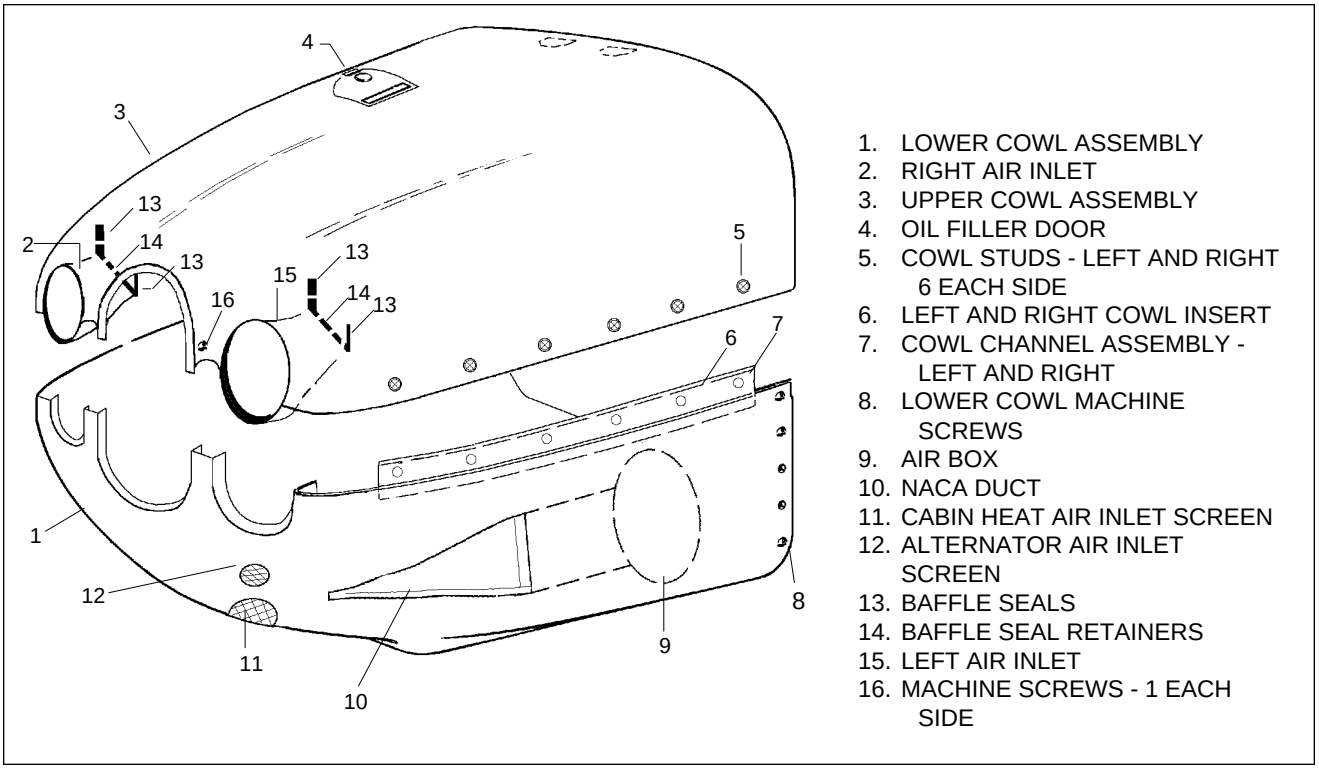

1. LOWER COWL ASSEMBLY
2. RIGHT AIR INLET
3. UPPER COWL ASSEMBLY
4. OIL FILLER DOOR
5. COWL STUDS - LEFT AND RIGHT 6 EACH SIDE
6. LEFT AND RIGHT COWL INSERT
7. COWL CHANNEL ASSEMBLY - LEFT AND RIGHT
8. LOWER COWL MACHINE SCREWS
9. AIR BOX
10. NACA DUCT
11. CABIN HEAT AIR INLET SCREEN
12. ALTERNATOR AIR INLET SCREEN
13. BAFFLE SEALS
14. BAFFLE SEAL RETAINERS
15. LEFT AIR INLET
16. MACHINE SCREWS - 1 EACH SIDE

Figure 71-7. Archer III Cowling (S/N's 2890206 and up)

B. Cleaning, Inspection and Repair of Cowling.

1. Clean cowling with suitable cleaning solvent and wipe dry with clean cloth.
2. Inspect cowling for dents, cracks, loose rivets, elongated holes, and damaged or missing fasteners.
3. Repair all defects to prevent further damage.

D. Installation of Cowling

1. Archer II. (Refer to figure 71-6.)

a. Place bottom cowling into position and install attaching screws.
b. Install induction air hose at filter housing from bottom of cowling and strut fairing.
c. Connect electrical lead to landing light.
d. Install aft end of top cowling and push front down and in.
e. Hook fasteners, two on each side and two at top of cowling.

2. Archer III - S/N's 2890206 and up. (Refer to Figure 7l-7.)

a. Using two people, one on each side of the airplane, position lower cowl onto airplane. Temporarily secure with the two top aft edge machine screws.

— NOTE —

The following steps can be completed by one person.

b. Install the two machine screws into bottom aft edge of cowl and the forward attachment screw located under nose strut fairing.
c. Install the remaining five machine screws along the ***right aft edge only.***
d. Remove the ***left top aft*** machine screw.

— NOTE —

With the top aft machine screw removed from the left side of cowl, there should be enough "give" in lower cowl to install carburetor air box hose and clamp to filter cover.

e. Attach carburetor air hose to air box and tighten clamp.
f. Install remaining five machine screws along left aft edge of cowl.
g. Attach alternator ventilating air and cabin air hoses to appropriate vents. Tighten clamps.

— NOTE —

When installing upper cowl, be sure that the baffle seals and retainer are inboard (behind or under the cowl lip) of the left and right air inlets.

h. Install upper cowl in position by keeping rear edge raised and pushing slightly forward. Be sure that the lower edge of cowl is outside of the left and right cowl inserts.
i. Install the studs securing upper cowl the cowl insert.
j. Install the two machine screws on both sides of propeller shaft opening.

k. Check that all screws and studs are tight.
l. Install nose strut fairing.
   (1) Locate aft section of fairing in proper position and secure with 4 screws.
   (2) Locate forward section of fairing in proper position so that it overlaps aft section.
   (3) Install remaining five screws securing fairing to cowl. Be sure that screws inserted through ***aft*** holes in ***forward*** section of fairing also go through the ***front*** holes in ***rear*** section of fairing.
   (4) Install the two screws located in each side of, and running through, both fairing sections.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

Island Enterprises

THIS PAGE INTENTIONALLY LEFT BLANK

AIR INTAKES

CARBURETOR ICE DETECTOR - ARCHER II (Refer to Figure 71-8)

1. General

The optional carburetor ice detection system, available only on the PA-28-l8l, Archer II, utilizes an optical probe installed in carburetor throat just upstream of throttle valve. As ice forms, and blocks the passage of light in the probe, the warning is triggered. When the ice melts, and enough light is sensed, the warning light will extinguish. The probe has an expected service life of 50,000 hours. A built in test circuit is activated each time the switch is turned ON, momentarily activating the warning light.

2. Troubleshooting

— CAUTION —

Do NOT attempt to test probe or instrument by applying voltage. A voltage over 2 volts will burn out probe lamp, the sensor and the instrument red light switching transistor.

a. Test probe as follows:
   (1) Disconnect probe from instrument at probe connectors.
   (2) Connect red (+) ohmmeter test probe to black wire of ice detector probe.
   (3) In subdued light (not sunlight) touch black ohmmeter test probe to red wire of ice detector probe. Reading must be approximately 600 ohms in ordinary light. Cover probe sensor with a hand to eliminate most light. Ohmmeter must read very high resistance (approximately l0,000 ohms or more) indicating sensor is good.
   (4) Remove ohmmeter black test probe from red wire and touch it to white wire. Ohmmeter must read approximately 5 ohms indicating probe lamp is operating satisfactorily.
   (5) If step c and d are satisfactory probe will function satisfactorily.
   (6) Test probe housing for short to ground (housing is insulated).

b. Test instrument as follows:
   (1) Disconnect probe at probe connectors.
   (2) Apply +l2 volts dc to power wire to instrument (red wire with fuse holder). Connect black ground wire to ground. Turn instrument switch ON. Red light should come on (if not, instrument is defective and must be returned to ARP Industries, Inc.).
   (3) If red light comes on, touch red wire connector to black wire connector (wires to instrument from probe). Red light must go out (if not, the instrument is defective and must be returned to ARP Industries, Inc.).

c. Test probe and instrument as follows:
   (1) Apply power to system and turn sensitivity control up from full ***counterclockwise*** position until red light just goes out (1/4 to 3/4 turn).
   (2) Place a piece of paper in air gap of probe (between sensor and housing lens). Red light should come on.

3. Functional Check of Ice Detector Probe

a. Aircraft master switch ON.
b. Ice detector switch ON.

c. Adjust sensitivity knob until red light (ice light) goes OUT. This is critical setting.
d. Turn ice detection system OFF, then ON. Red light must flash ON, then OFF, indicating all components are operating normally.

4. Removal of Ice Detector Probe

a. Remove engine cowling.
b. Probe is mounted in carburetor upstream of the throttle valve control arm. Remove safety wire and carefully unscrew probe from carburetor. Measure and note how far probe extends into carburetor.
c. Where wires for probe come off engine mount, remove wire insulation sleeves; note the respective wire interconnects and disconnect wires.
d. If engine is to be operated, install a suitable plug.

5. Installation of Ice Detector Probe

a. If plug is installed, remove plug from carburetor housing. Probe is mounted just below throttle valve on the left side of carburetor.

— CAUTION —

Do not bend probe components.

b. Carefully screw in probe. When installed, index mark on probe housing must face carburetor air inlet. If necessary use AN9604l6L shim washers to position probe properly.
c. Tighten probe as much as possible, by hand, and then only, a quarter turn more using a 3/8 inch short handle open end wrench.
d. Connect appropriate wires and position sleeves over connectors. If heat shrink has not been used, tie with no. 6 electrical lacing wire.

— NOTE —

ARP Industries, Inc. is the only FAA approved repair station for ice detector instrument. Return defective instrument to:

ARP Industries, Incorporated
36 Bay Drive East
Huntington, New York 11743
Phone (516) 427-1585

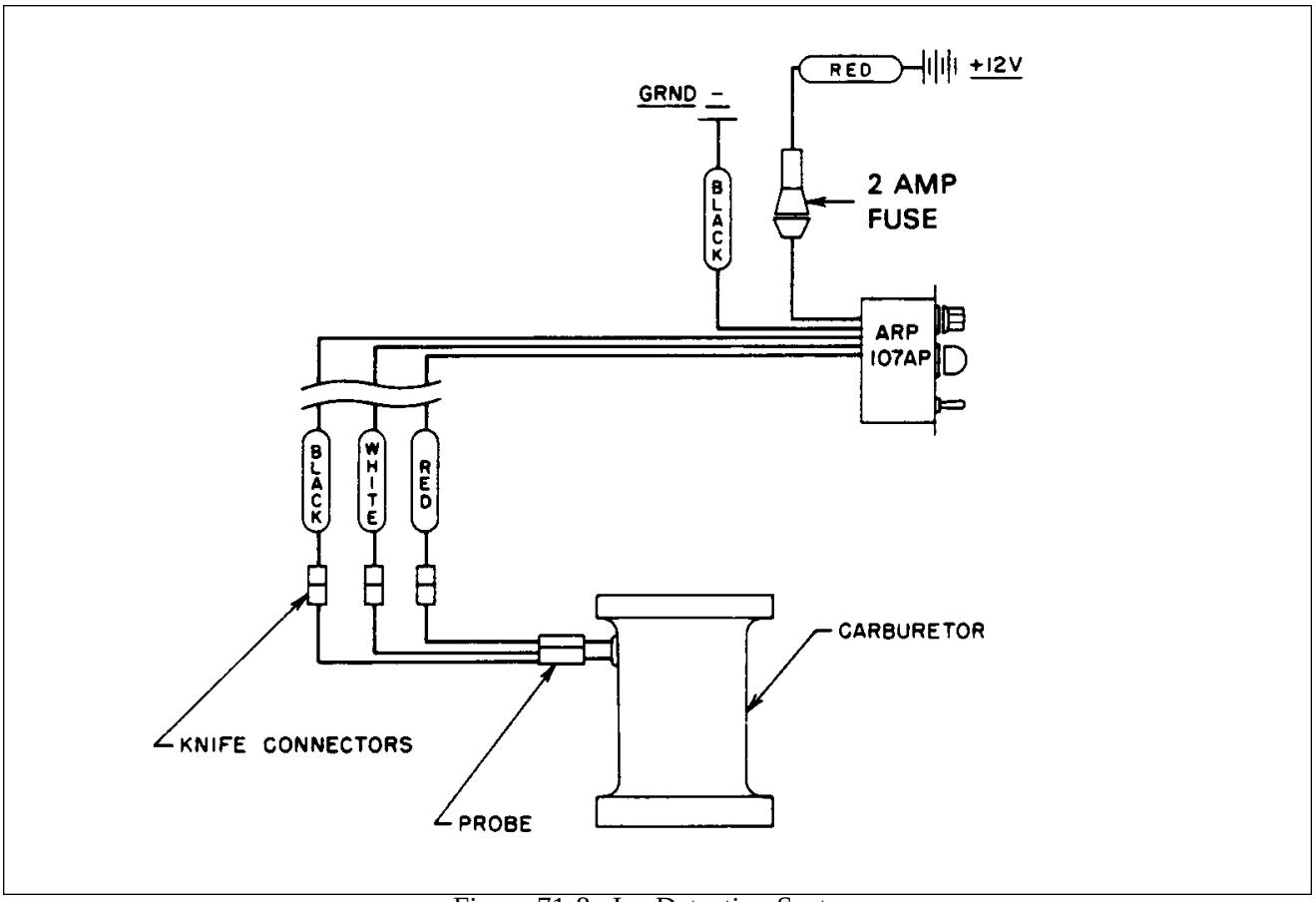


Figure 71-8. Ice Detection System

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

73

ENGINE FUEL SYSTEM

3D24

CHAPTER 73 - ENGINE FUEL SYSTEM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
73-00-00	GENERAL	3E3	
73-10-00	DISTRIBUTION	3E4	
73-10 00	Carburetor Maintenance	3E4	
73-10-00	Throttle Arm	3E4	
73-10-00	Adjustment of Idle Mixture	3E4	
73-10-00	Adjustment of Idle Speed	3E5	
73-10-00	Primer Systems	3E5	
73-10-00	Archer II	3E5	
73-10-00	Removal of Engine Primer	3E5	
73-10-00	Disassembly, Cleaning and Assembly of Engine Primer	3E5	
73-10-00	Installation of Engine Primer	3E6	
73-10-00	Archer III	3E6	
73-10-00	Primer Jets	3E6	
73-20-00	CONTROLLING	3E10	
73-20-00	Adjustment of Throttle and Mixture Controls	3E10	
73-30-00	INDICATING	3E12	
73-30-00	Fuel Pressure Gauge	3E12	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

This chapter gives information on service and replacement procedures of the Archer II and Archer III engine fuel system.

— WARNING —

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

THIS SPACE INTENTIONALLY LEFT BLANK

DISTRIBUTION

A. CARBURETOR MAINTENANCE

In general, little attention is required between carburetor overhauls. Check the following at engine inspection.

1. Check tightness and safety of all nuts and screws which fasten carburetor to engine.
2. Check all fuel lines for tightness and evidence of leakage.
3. Check throttle and mixture control rods and levers for travel, tightness, and safety.
4. Clean fuel inlet screen. (Refer to Figure 73-1.)
5. Remove plug at the aft position of carburetor and drain any accumulation of foreign matter.
6. Check carburetor air box for wear and full travel of heat door.
7. Check adjustment of idle mixture and idle speed. (Refer to adjustment of idle mixture and adjustment of idle speed.)

B. THROTTLE ARM

— CAUTION —

Verify torque handle is correctly calibrated to ensure attaching screw is not under or over tightened

1. Remove screw securing throttle arm to carburetor. Do not remove throttle arm.
2. Remove and discard lock tab.
3. Check if there is a hole through head of screw. If not, drill a 1/16 diameter hole through head of screw.
4. Install screw. Tighten to a torque of 20 to 28 inch-pounds.
5. Use 0.032 inch diameter safety wire, tie wire to idle stop lever, and continue as shown in Figure 73-1.
6. Sequence and direction of tying may vary with carburetor model. Tie together idle stop arm, throttle arm, and attaching screws.

C. ADJUSTMENT OF IDLE MIXTURE (Refer to Figure 73-1)

—WARNING—

For indoor engine warm-up, provide a barrier around engine to prevent serious injury. Also provide adequate ventilation of work area.

1. Do standard engine starting procedure and operate engine for at least two minutes between 800 and 1200 rpm for proper engine warmup.
2. Draw back on cockpit throttle control lever for a reading of approximately 550 rpm on tachometer.
3. Turn idle mixture adjusting screw near the rear of carburetor, clockwise, leaning the fuel mixture. Continue until engine begins to run roughly (engine speed will decrease).
4. Turn screw counterclockwise until engine runs smoothly again. Continue to turn screw (same direction) until engine begins to run roughly again. At this point, fuel mixture will be too rich and engine speed will decrease.
5. Advance screw to midway between lean and rich fuel mixture; engine rpm will reach a maximum speed for idle mixture settings.

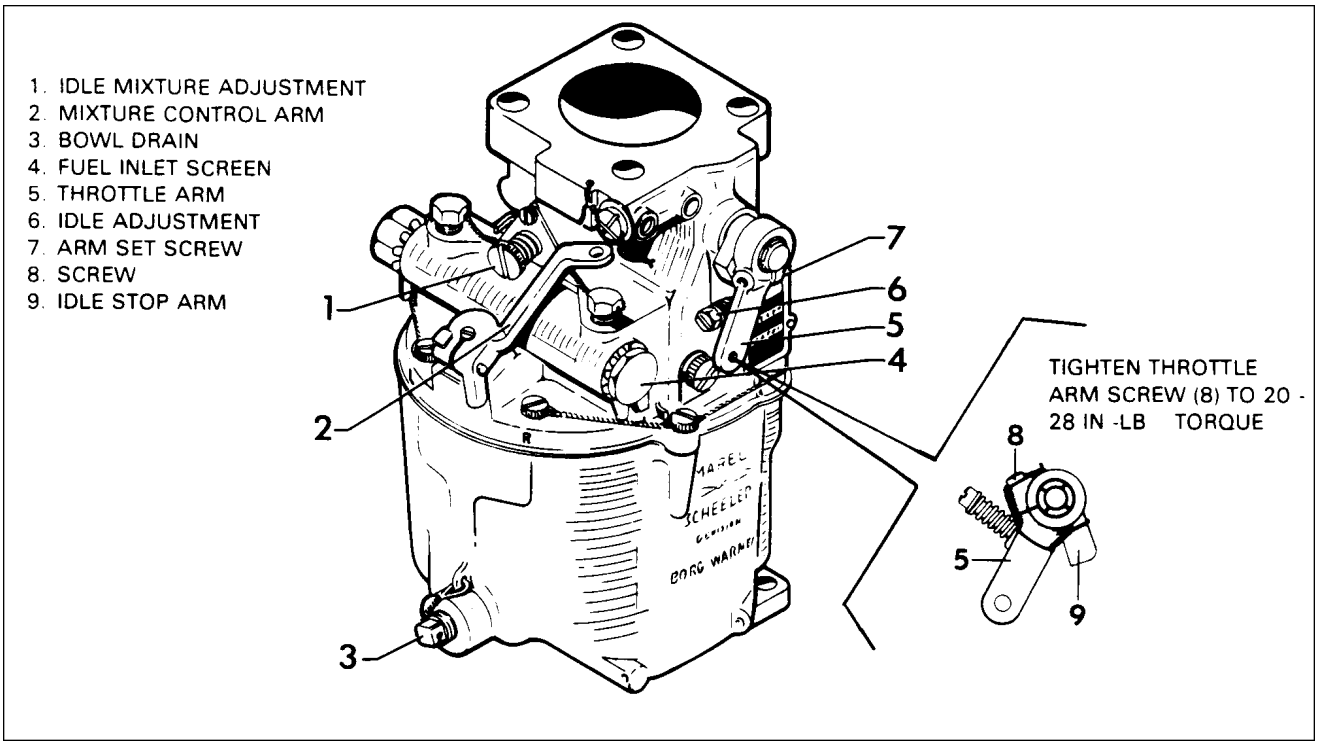

1. IDLE MIXTURE ADJUSTMENT
2. MIXTURE CONTROL ARM
3. BOWL DRAIN
4. FUEL INLET SCREEN
5. THROTTLE ARM
6. IDLE ADJUSTMENT
7. ARM SET SCREW
8. SCREW
9. IDLE STOP ARM
TIGHTEN THROTTLE ARM SCREW (8) TO 20 - 28 IN -LB TORQUE

Figure 73-1. Carburetor

D. ADJUSTMENT OF IDLE SPEED (Refer to Figure 73-1)

— NOTE —

One complete revolution of idle screw gives a variation of approximately 100 rpm idling speed

E. PRIMER SYSTEMS

1. Archer II

The Archer II has a manually operated plunger type fuel priming system.

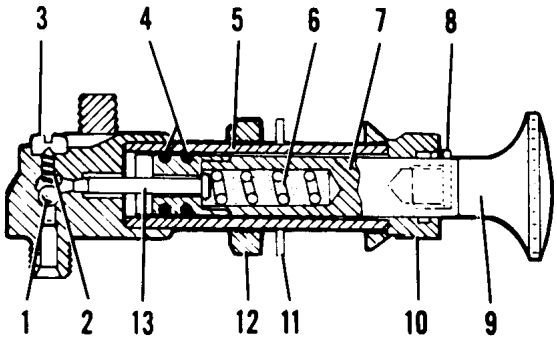
a. Removal of Engine Primer

(1) Disconnect fuel lines from primer behind instrument panel.
(2) Loosen locknut from behind panel.
(3) Unscrew knurled face nut, and withdraw pump handle and piston from cylinder.
(4) Remove remaining portion of primer.

b. Disassembly, Cleaning and Assembly of Engine Primer (Refer to Figure 73-.2)

(1) Primer may be disassembled after removal by removing screws, springs, and check balls from the end of cylinder housing.
(2) Clean primer parts with acetone or dry type solvent.

(3) Install new O-rings to piston and lubricate with light motor oil.
(4) Install balls, springs, and screws to cylinder housing.
(5) Insert pump handle and piston into cylinder, and finger tighten knurled face nut.
(6) Immerse pump in gasoline and operate several times to ensure proper operation.



1. CHECK BALL
2. BALL SPRING
3. RETAINER SCREW
4. O-RINGS
5. CYLINDER
6. SEALING SPRING
7. PISTON
8. STOP PIN
9. PUMP HANDLE
10. FACE NUT
11. WASHER
12. LOCK NUT
13. SEALING PIN

Figure 73-2. Archer II Engine Fuel Primer

c. Installation of Engine Primer (Refer to Figure 73-2.)

(1) Remove pump handle and piston by unscrewing knurled face nut, if installed.
(2) Insert cylinder assembly through back side of panel.
(3) Insert piston into cylinder and tighten knurled face nut.
(4) Position primer and tighten locknut on cylinder behind panel.
(5) Connect fuel lines to primer.
(6) Disconnect primer line inside engine compartment. Run pump to verify proper operation.

2. Archer III (S/N's2890206 and up) (Refer to Figure 73-3)

The electrical primer system installed on the Archer III is virtually trouble free. Should the primer system fail to operate check that there is power to the primer switch. If the switch checks satisfactorily, check that the electric fuel pump is working by selecting the Fuel Pump switch ON and check that a pressure reading is observed on the fuel pressure gauge. The solenoid may be checked by removing one of the injector (refer to paragraph F) and momentarily activate the primer switch. If there is no fuel flow, and the primer switch and electric pump have checked satisfactorily, the problem is a bad solenoid. Refer to Chapter 91 for the electrical schematic of the fuel pump and priming system.

F. PRIMER JETS

The fuel primer jets used on both the Archer II and Archer III are maintained in the same manner.

1. To remove primer jets, disconnect supply line from each jet. With a deep socket and light pressure, remove jet from cylinder.

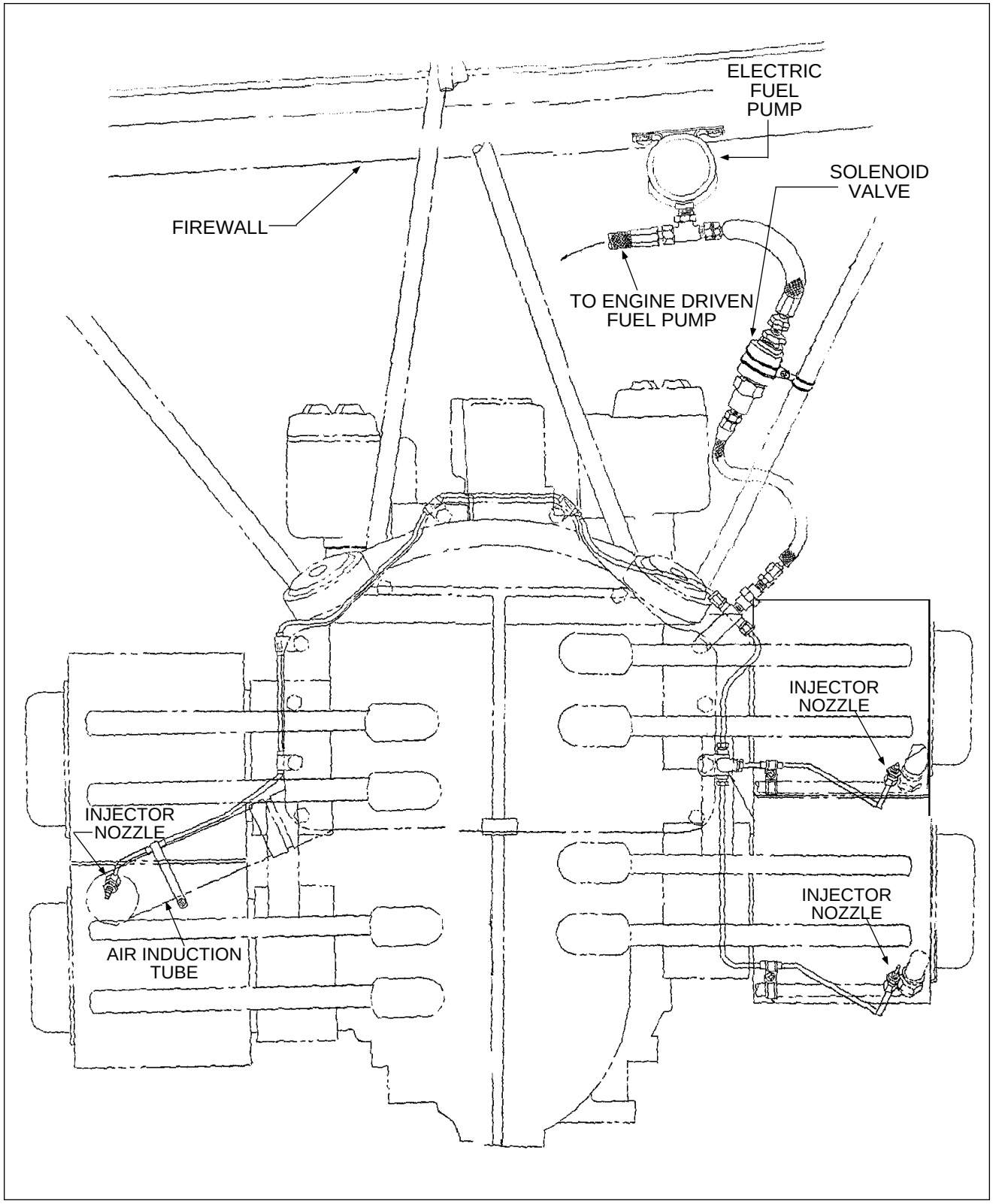


Figure 73-3. Archer III Fuel Primer System

2. To clean jet, soak in carbon remover solution long enough to loosen any dirt and blow clean with air pressure. Do not use sharp objects or wire brush to clean jet tube.
3. Install jet finger tight so threads are not crossed and tighten to a torque of 60 inch-pounds. Align and install fuel supply lines, tighten to a snug fit.

—NOTE—

If there is further fuel stoppage of primer system, check supply lines for stoppage, bent, or collapsed walls.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CONTROLLING

ADJUSTMENT OF THROTTLE AND MIXTURE CONTROLS (Refer to Figure 73-3.)

Throttle and mixture controls on both the Archer II and Archer III are adjusted so that, when the throttle arm on carburetor is rotated forward against its full throttle stop, ***and*** the mixture control is rotated forward against its full rich stop, the cockpit control levers of throttle and mixture must have an 0.010 to 0.030 inch spring back in the forward position.

1. Adjust throttle as follows:
   a. At the carburetor, disconnect the rod end of the throttle control cable from the control arm. Loosen the jamnut that secures the rod end.
   b. Adjust linkage by rotating the rod end on the cable for a 0.010 to 0.030 inch spring back on the instrument stop when in the full throttle position.
   c. Connect the rod end to the control arm and tighten to a torque of 35–40 inch-pounds.
2. Adjust mixture as follows:
   a. At the carburetor, disconnect the rod end of the mixture control cable from the control arm. Loosen the jamnut that the secures rod end.
   b. Adjust the linkage by rotating the rod end on cable for 0.010 to 0.030 inch spring back on the instrument panel stop when in the full rich position.
   c. On aircraft with air conditioning systems, a micro switch is below the throttle control and is set to actuate in the full open position. With the throttle control adjusted for 0.010 to 0.030 inch clearance, adjust the micro switch to actuate at this point.
   d. Connect the rod end to the control arm, and safety.
3. Check security of the cable casing attachment.
4. Pull the throttle and mixture levers in cockpit full aft to verify that the idle screw contacts its stop and the mixture control arm contacts its lean position. A mixture control lock is in the quadrant cover which prevents the mixture control from being moved to the idle cutoff position inadvertently. The lock must be depressed before the control can be moved completely aft. Verify that the lock operates freely with no tendency to bind or hang up.

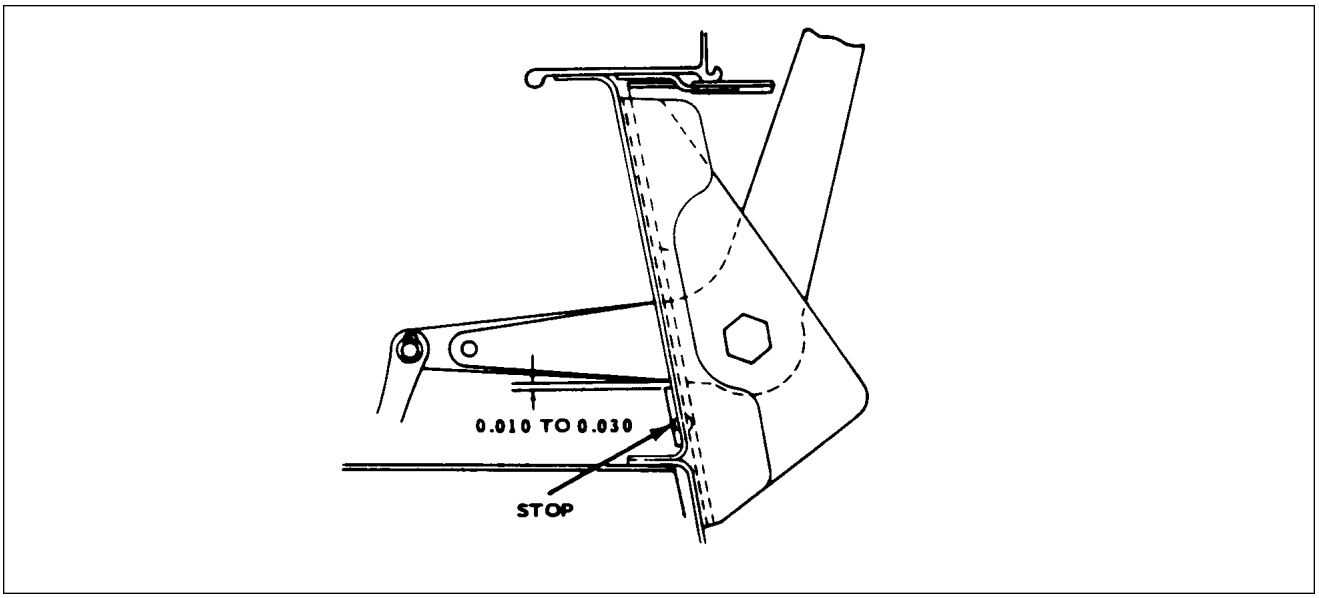


Figure 73-4. Adjustment of Engine Controls

THIS PAGE INTENTIONALLY LEFT BLANK

INDICATING

Fuel Pressure Gauge.

The fuel pressure gauge instrument is mounted in the cluster on instrument panel. On the Archer II, the gauge is connected to the fuel system at the carburetor fuel inlet fitting.

The fuel pressure gauge on the Archer III is also mounted in a cluster on the instrument panel. Pressure information is transmitted electrically to the fuel pressure gauge by a sender unit clamped to the upper left engine mount. The sender unit is connected by an independent fuel line, to a tee fitting at the carburetor inlet, where it can sense the pressure of fuel entering the carburetor. Refer to Chart 7302 and Figure 73-5 for data required to calibrate the **Archer III** fuel pressure gauge.

CHART 7301. TROUBLESHOOTING FUEL PRESSURE GAUGE (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
No fuel pressure indication.	Fuel valve stuck.	Check valve.
	No fuel in tanks.	Check fuel, fill.
	Defective fuel pump(s).	Check pump(s) for pressure buildup. Check diaphragm and relief valves in engine driven pump. Check for obstruction in electric pump. Check bypass valve. Air leak in in take lines.
	Defective gauge.	Replace gauge.
	(Archer III). Tripped ENGINE GAUGE circuit breaker.	Reset circuiy breaker. If breaker does not remain set, check wiring and components for short.
	(Archer III). Faulty sender.	Replace sender.
Pressure low or pressure surges.	Obstruction in inlet side of pump.	Trace lines and locate obstruction.
	Faulty bypass valve.	Replace.
	Faulty diaphragm.	Replace or rebuild pump.
Needle fluctuation.	Surge dome on pump filled with fuel.	Remove and empty.
	Air in line.	Loosen line at gauge, turn on electric pump. Purge line of air and retighten.

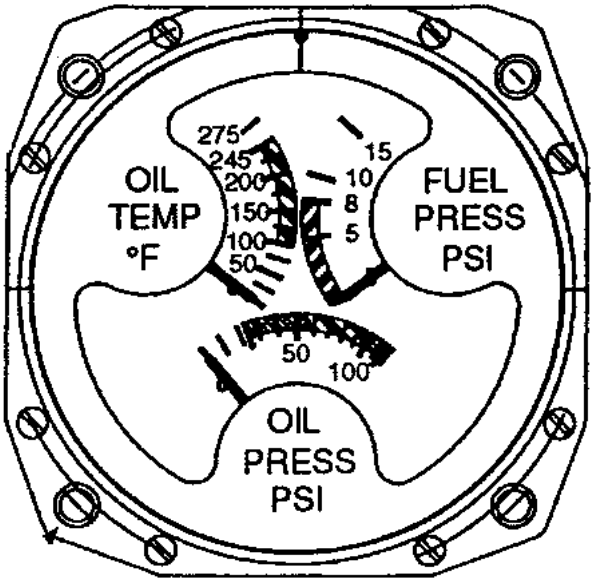
CHART 7301. TROUBLESHOOTING FUEL PRESSURE GAUGE (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
High fuel pressure with engine shut off right after flight.	Fuel in line expanding due to heat build-up in cowling.	Normal.

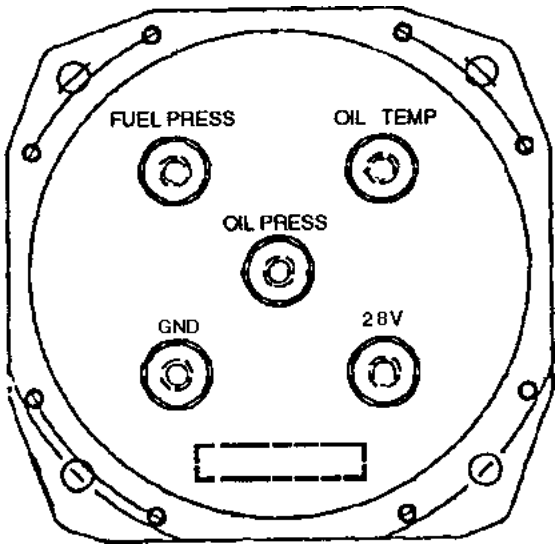
CHART 7302. ARCHER III INSTRUMENT CALIBRATION CHART

CALIBRATION CHART OIL PRESSURE TOL ± 2%			**CALIBRATION CHART FUEL PRESSURE**			CALIBRATION CHART OIL TEMP. TOL ± 2%		
PSI	OHMS	DEGREES	**PSI**	**OHMS**	**DEGREES**	°F	OHMS	DEGREES
0	9	- 40.0	**0**	**10**	**-40**	0	84.50	-40.0
25	42	-16.4	**5**	**42**	**-13.33**	50	93.80	-27.0
60	90	10.5	**8**	**60**	**2.67**	150	114.49	1.0
100	135	30.9	**10**	**72**	**13.33**	275	144.60	40.0

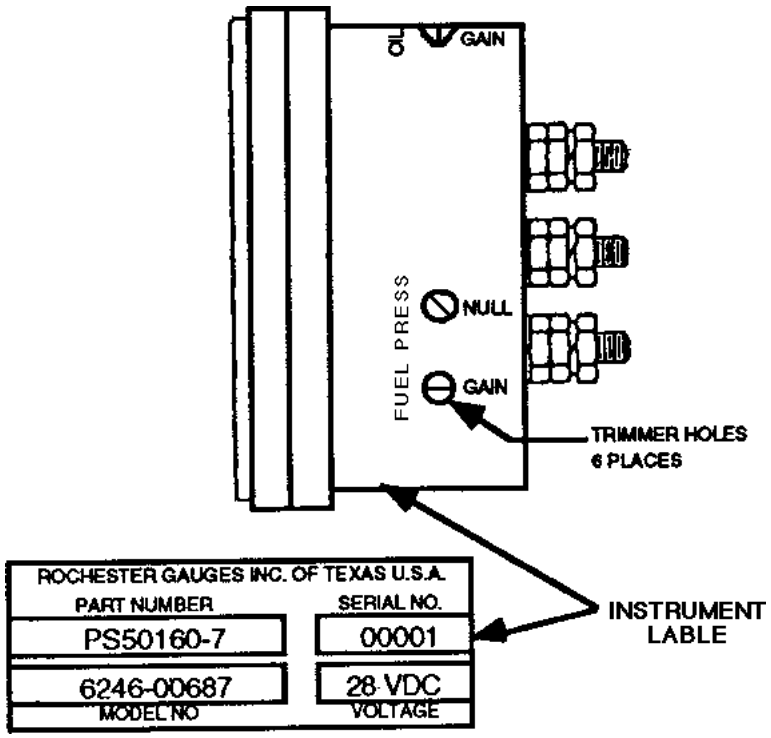
THIS SPACE INTENTIONALLY LEFT BLANK



FRONT VIEW



REAR VIEW



PROFILE VIEW - FUEL PRESSURE ADJUSTMENT

Figure 73-5. Archer III Instrument Cluster - Fuel Pressure Gauge

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

74

IGNITION

3E16

CHAPTER 74 - IGNITION

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
74-00-00	GENERAL	3E19	
74-00-00	Description and Operation	3E19	
74-00-00	Troubleshooting	3E19	
74-10-00	ELECTRICAL POWER SUPPLY	3E22	
74-10-00	Archer II	3E22	
74-10-00	Slick Magnetos	3E22	
74-10-00	Removal of Magnetos	3E22	
74-10-00	Inspection of 4000 and 4200 Series Magnetos	3E22	
74-10-00	Installation and Procedure for Timing 4000/4100 Series Magneto to Engine	3E24	
74-10-00	Overhaul Instructions for 4200 Series Magnetos	3F1	
74-10-00	Disassembly of Magnetos	3F1	
74-10-00	Cleaning and Inspection of Magnetos	3F4	
74-10-00	Assembly of Magnetos	3F4	
74-10-00	4200 Series Magnetos Internal Timing Procedure	3F8	
74-10-00	4200 Series Magnetos Installation And Timing Magnetos to Engine Procedure	3F8	
74-10-00	Bendix Magnetos	3F9	
74-10-00	Inspection of Magnetos	3F9	
74-10-00	Removal of Magneto	3F11	
74-10-00	-20 and -200 Series Magneto Internal Timing Procedure	3F11	
74-10-00	Installation and Timing Magneto to Engine Procedure	3F13	
71-10-00	Archer III	3F14	
74-20-00	DISTRIBUTION	3F17	
74-20-00	Harness	3F17	
74-20-00	Inspection of Harness	3F17	
74-20-00	Removal of Harness	3F17	
74-20-00	Disassembly of Harness	3F17	
74-20-00	Harness Assembly Instructions	3F20	
74-20-00	Installation of Harness	3F22	
74-20-00	Spark Plugs	3F22	
74-20-00	Removal of Spark Plugs	3F22	
74-20-00	Inspection and Cleaning of Spark Plugs	3F23	
74-20-00	Installation of Spark Plugs	3F23	

CHAPTER 74 - IGNITION

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
74-30-00	SWITCHING	3G2	
74-30-00	Ignition And Starter Switch	3G2	
74-30-00	Removal of Ignition / Starter Switch	3G2	
74-30-00	Archer II	3G2	
74-30-00	Archer III — Removal of Starter Switch	3G2	
74-30-00	Archer III — Removal of Magneto Switch(es)	3G2	
74-30-00	Installation of Ignition / Starter Switch	3G4	
74-30-00	Archer II	3G4	
74-30-00	Archer III — Installation of Starter Switch	3G4	
74-30-00	Archer III — Installation of Magneto Switch(es)	3G4	

GENERAL

— WARNING —

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

This chapter gives information on service and replacement procedures of the ignition system.

DESCRIPTION AND OPERATION

Magnetos on the Archer II model airplane may be the Slick 4000 series, Slick 4100 series, Slick 4200 series. Bendix S-20 or S-200 series.

The Slick 4000 and 4100 series magnetos are installed with their associated components. These series magnetos are engineered to give trouble free ignition and are exchanged for factory rebuilt units upon engine overhaul for a nominal cost. Slick 4000 and 4100 series magnetos are ***not*** serviceable units.

The 4200 series magnetos are completely self-contained and have impulse coupling on the left magneto to aid starting. These magnetos are serviceable units.

The Bendix series magnetos are installed with their associated components and with the Slick harness assembly. The Slick harnesses for Bendix magnetos are furnished with an adapter plate and grommet for fast easy connection to the magnetos. This magneto system has two single contact magnetos with left magneto incorporating an impulse coupling to aid starting. Bendix magnetos are serviceable units.

Magnetos used on the Archer III are provided by the Slick Division of Unison Industries. Refer to the Unison's Master Service Manual, p/n F1100, when servicing magnetos used on the Archer III.

TROUBLESHOOTING

The following chart lists common troubles, their probable causes, and suggested remedies.

CHART 7401. TROUBLESHOOTING ***ARCHER II*** MAGNETOS (SHEET 1 OF 2)

TROUBLE	CAUSE	REMEDY
Engine does not start.	Defective spark plugs.	Clean and adjust or replace spark plugs.
	Defective ignition wire.	Check with electric tester and replace any defective wires.
	Improper operation of magneto.	Check timing of magnetos.
	Improper switch wiring for left magneto starting.	Reverse magneto switch wires.
	Magnetized impulse coupling left magneto only.	Demagnetize impulse couplings.
	Frozen spark plug electrodes.	Replace spark plugs or dry out removed plugs.

CHART 7401. TROUBLESHOOTING ***ARCHER II*** MAGNETOS (SHEET 2 OF 2)

TROUBLE	CAUSE	REMEDY
Engine does not start. (cont.)	Shorted ignition switch or loose ground.	Check and replace or repair.
Engine idles improperly	Faulty ignition system.	Check entire ignition system.
	Improper spark plug setting for altitude.	Check spark plug gap.
Low power and rough running engine.	Defective spark plugs.	Clean or replace spark plug.
	Magneto not working properly.	Check timing of magneto.
	Defective ignition wire.	Check wire with electric tester. Replace defective wire.
	Defective spark plug terminal connections.	Replace connectors or spark plug wire.
	Improper ignition timing.	Check magnetos for timing and synchronization.
	Lead deposit on spark plugs.	Clean or replace plugs.
Engine does not develop full power.	Faulty ignition.	Tighten all connections. Check system. Check ignition timing.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

ELECTRICAL POWER SUPPLY

ARCHER II

A. Slick Magnetos

— WARNING —

Verify primary circuit of the engine is grounded before engine work.

— CAUTION —

Magneto service instructions in this manual cover minor repairs and timing. For further repairs and adjustments of magnetos, follow manufacturer's service instructions.

— NOTE —

The 4000 and 4100 series Slick magnetos are not serviceable. Refer to latest revision Textron Lycoming Service Letter L177.

B. Removal of magnetos

Before removing magnetos, verify magneto switches are OFF.

— WARNING —

The magneto is not internally grounded. When ground lead is disconnected magneto is HOT. Removing harness assembly first, and installing them last, minimizes danger of starting engine accidentally when ground lead is removed from magneto.

1. Remove harness assembly with spark plug wire housing from magneto.
2. Disconnect ground lead at magneto.
3. Remove nuts and washers, and remove magnetos from engine.

C. Inspection of 4000 and 4200 series Magnetos

The 4000 and 4100 series magnetos are sealed and must not be tampered with. Tampering will void warranty. (Refer to latest revision Lycoming Service Letter L177 and Slick pro rata instruction form 1001). The 4200 series magnetos are serviceable and can be inspected in the field. At engine inspection or when a magneto has been removed from engine, check as follows:

1. Magneto to engine timing for the 4000 series and the 4200 series magneto must be checked every 100 hours or at annual inspection, whichever comes first.
2. Inspect distributor block for cracks and burned areas.
3. Check contact assemblies on 4200 series for burning and wear every 500 hours. Do the following steps:
   a. Inspect points for discoloring. If points have a white frosty surface around edges, points are functioning properly. Apply M- 1827 cam grease sparingly to each cam lobe before assembly.

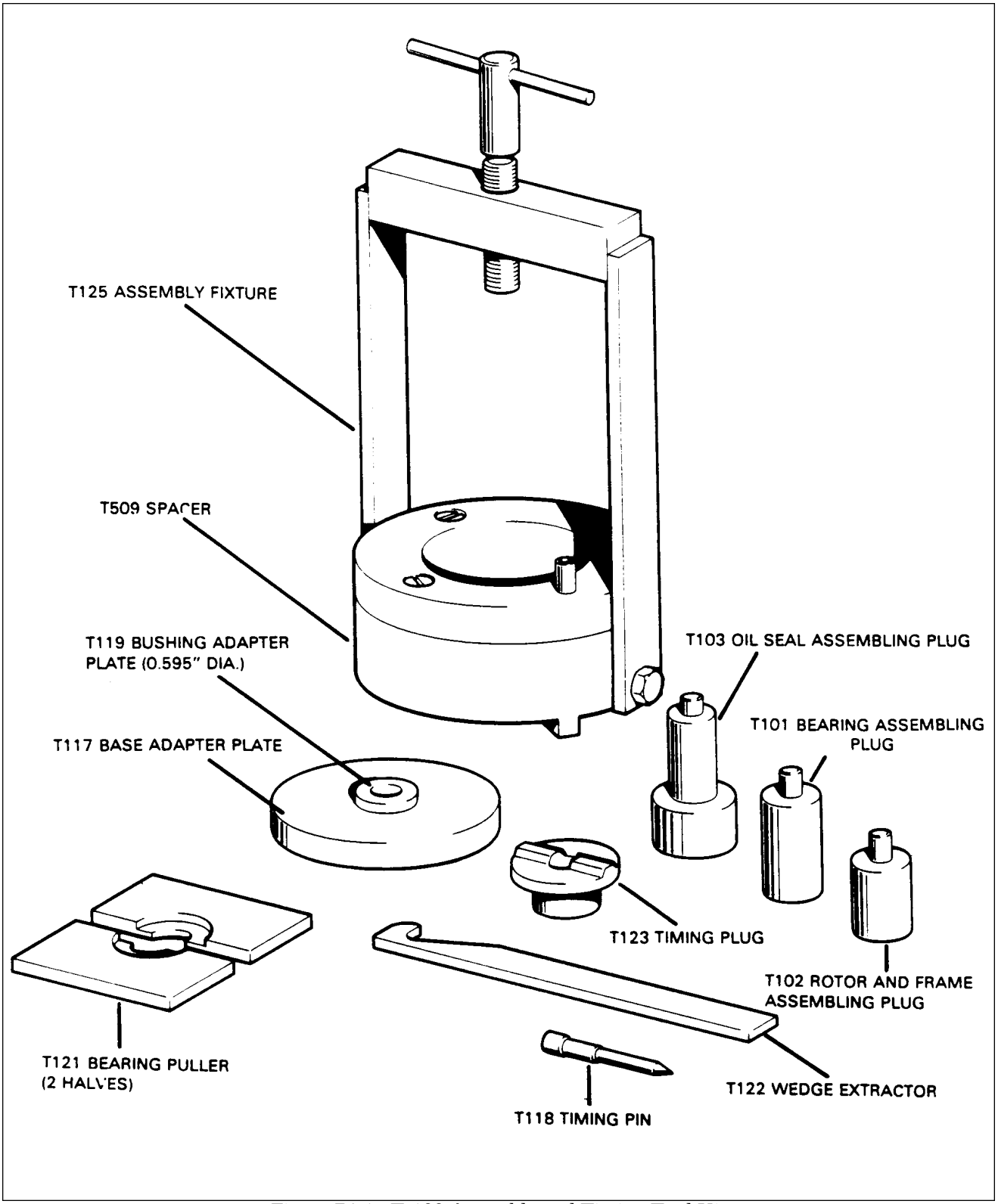

T125 ASSEMBLY FIXTURE
T509 SPACER
T119 BUSHING ADAPTER PLATE (0.595" DIA.)
T117 BASE ADAPTER PLATE
T103 OIL SEAL ASSEMBLING PLUG
T101 BEARING ASSEMBLING PLUG
T123 TIMING PLUG
T102 ROTOR AND FRAME ASSEMBLING PLUG
T121 BEARING PULLER (2 HALVES)
T122 WEDGE EXTRACTOR
T118 TIMING PIN

Figure 74-1. T-100 Assembly and Timing Tool Kit

b. Inspect points for discoloring and pitting. If these conditions are evident, replace both condenser and points.

— CAUTION —

Point opening for these magnetos is critical When setting breaker points, stay within specified 0.008-0.010 inch tolerance. The most efficient spark is obtained at this point setting.

c. Check gap after retainer screws are tightened.

4. Inspect carbon brush in distributor gear (4200 series magnetos) for wear, cracks, and chipping every 500 hours. Do the following steps:
   a. Measure carbon brush length from distributor gear shaft to end of brush. Minimum length is 1/32 inch. If the above conditions are evident replace carbon brush.
   b. Check bearing in distributor block and bearing bar for lubrication. If needed add a drop of SAE #20 non-detergent oil to each bearing.
   c. Replace distributor gear if worn, cracked, or chipped.
5. Inspect high tension lead from coil (4200 series magnetos) to make sure it makes contact with carbon brush on distributor gear shaft.
6. Visually inspect impulse coupling shell and hub (4200 series magnetos) for cracks, loose rivets, or rounded pawls every 500 hours. If pawls are rounded they will slip when latching up on the pin. If any of these conditions are evident, coupling must be replaced.
7. Look for frayed insulation or broken wire strands in leads at back of magnetos. Check terminals are secure and properly positioned.
8. Check the lead conduits. A few broken strands are acceptable, but if the insulation is deteriorated, replace it. Special high temperature coating, used on harness is provided for vibration resistance and mechanical protection. Harness integrity is not sacrificed if small areas of the braid show peeling or flaking of this coating.
9. Check springs for breaks, corrosion, or deformation. Check continuity from block with tester or light.
10. Check insulators for cracks, breaks, or evidence of aging. Be sure they are clean.
11. Check ventilator plugs. Ventilator has drilled holes and must be in the lowest hole in magneto to drain excess water or oil.

D. Installation and Procedure for Timing 4000/4100 Series Magneto To Engine

Install and time magnetos to engine as follows:

1. Remove top spark plug from number one cylinder. Place thumb of one hand over spark plug hole and rotate crankshaft in direction of normal rotation until compression stroke is reached. Compression stroke is indicated by a positive pressure inside cylinder tending to lift thumb off spark plug hole. In this position both valves of number one cylinder are closed. Turn crankshaft opposite its normal rotation direction until it is approximately 25 degrees before top dead center (btdc) on compression stroke of number one cylinder. Rotate crankshaft in its normal rotation direction until 20 degrees mark on starter ring gear and hole in starter housing align.
2. Be sure to spark out magnetos before installing on engine. Use the following method for model 4151 left hand magneto (with impulse coupling):

— CAUTION —

Impulse coupling magneto can only be used on the left side of engine (viewed from the rear).

a. Remove bottom vent plug from magneto.
b. Hold number one lead wire spring 0.062 to 0.125 inch from magneto frame.
c. Turn impulse coupling or gear one click at a time until a strong spark jumps between spring and magneto frame.
d. Hold magneto firmly so coupling will not move beyond point where it trips and spark occurs.
e. Reverse rotation approximately 20 degrees until timing pin hole appears in center of vent plug hole.
f. Hold rotor by inserting timing pin, line timing pin with center of vent plug holes, install magneto and gasket on mounting pad of accessory housing, and remove timing pin. Tighten nuts only finger tight.

3. Fasten ground wire of electric timing light to any unpainted metallic portion of engine, and one of the positive wires of the timing light to a suitable terminal connected to ground terminal connection of left magneto. Turn engine crankshaft several degrees from before top dead center (btdc) in opposite direction of normal rotation.
4. Turn on timing light switch. Turn crankshaft very slowly in normal rotation direction until timing mark on front face of starter ring gear aligns with drilled hole in starter housing. Light must come on (battery operated models). If not, turn magneto in its mounting flange slots and repeat until light goes on at 20 degrees btdc. Tighten two mounting nuts and replace bottom vent plug.

— NOTE —

A/C timing lights operate in reverse as described above. Light goes out when breaker points open.

5. Spark out model 4150 magneto, ***without*** impulse coupling, as follows:
   a. Install gear and hold number one lead wire 0.062 inch away from magneto frame.
   b. Turn gear counterclockwise (left) vigorously through flux lines until a strong spark occurs at number one lead.
   c. Reverse rotation until the timing pin hole appears. Insert timing pin in hole and install magneto and gasket on right magneto mounting pad of accessory housing. Remove timing pin and tighten nuts finger tight only, proceed with timing.
6. Connect the other positive wire of the timing light to a suitable terminal connection of right magneto. Time magneto as described for left magneto.
7. After both magnetos have been timed, leave timing light wires connected and check magneto timing previously described. Make sure both magnetos are set to fire together. If timing is correct, both timing lights will come on simultaneously when 20 degree mark on ring gear aligns with drilled hole in starter housing. If points open early, loosen mounting nuts and rotate magneto counterclockwise. Secure nuts and remove timing lights.

E. Overhaul Instructions for 4200 series Magnetos

1. Disassembly Of Magnetos (Refer to Figure 74-3.)

— CAUTION —

The slick T-100 assembly and timing kit is strongly recommended. The tools in this kit will greatly aid magne - to disassembly/assembly and help prevent damage to parts.

a. Remove cotter pin, nut, washer, and gar. Grasp shell of impulse coupling assembly and gently pull assembly outward to clear unlatching ears.
b. Allow shell to turn, cautiously releasing spring tension, and withdraw shell and coil spring. Using slick puller T-106 in the grooves on impulse hub, pull assembly off shaft taper and discard. Remove key.
c. Remove four screws and four washers. Separate distributor housing sufficiently to disconnect condenser lead at contact breaker assembly.
d. Remove two screws and two washers. Withdraw and discard bearing bar, distributor gear, and distributor block from distributor housing.
e. Using two flat blade screwdrivers or equivalent, placed under rotor gear, gently pry gear off rotor shaft and discard.
f. Remove and discard breaker assembly by removing screw and washer. Remove cam by prying straight up with a screwdriver blade and discard.
g. Remove two screws, two washers, and two bearing plate clamps. Press against drive end of rotor shaft and withdraw rotor, bearing plate, loading spring, and washer from end frame. Place rotating magnet in a suitable keeper and press ball bearings off journals. Discard ball bearings and washer.
h. Using coil wedge extractor T-122, remove coil wedges, lift out, and discard coil. (Refer to Figure 74-2.) Remove air vents. Remove and discard oil seal.

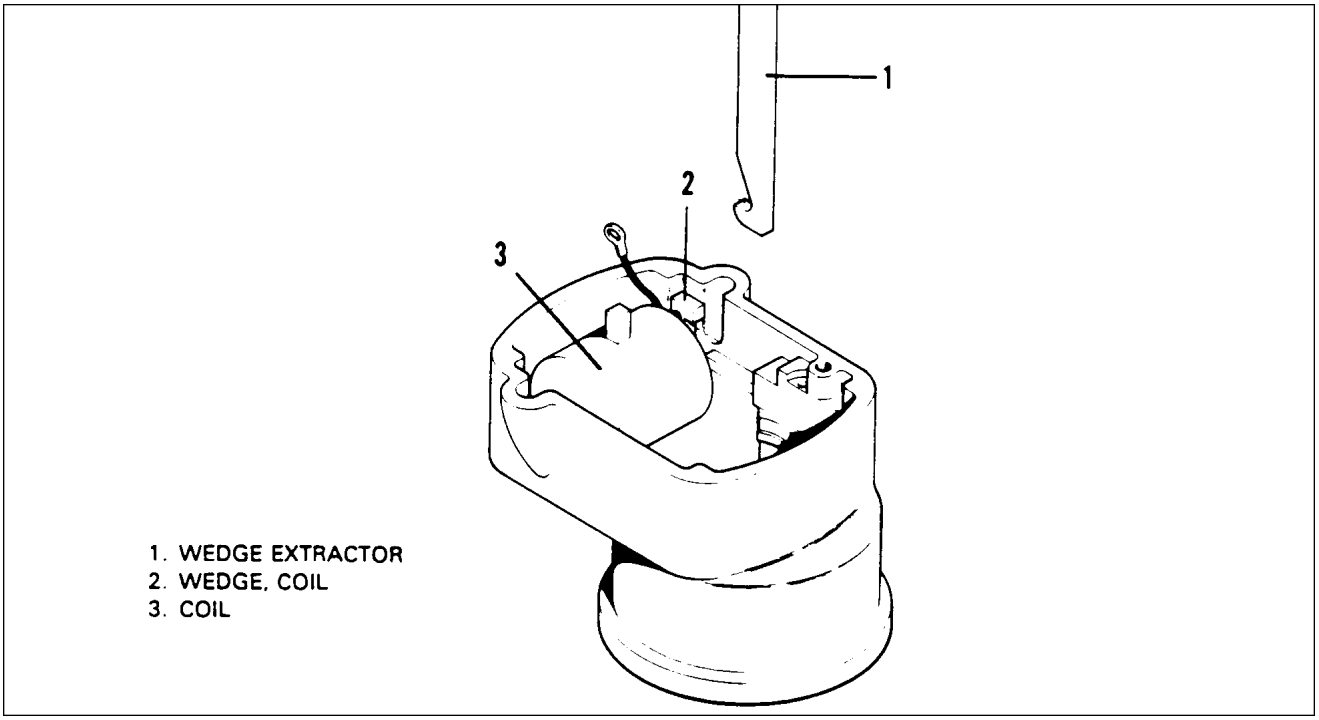


Figure 74-2. Removing Coil Wedges

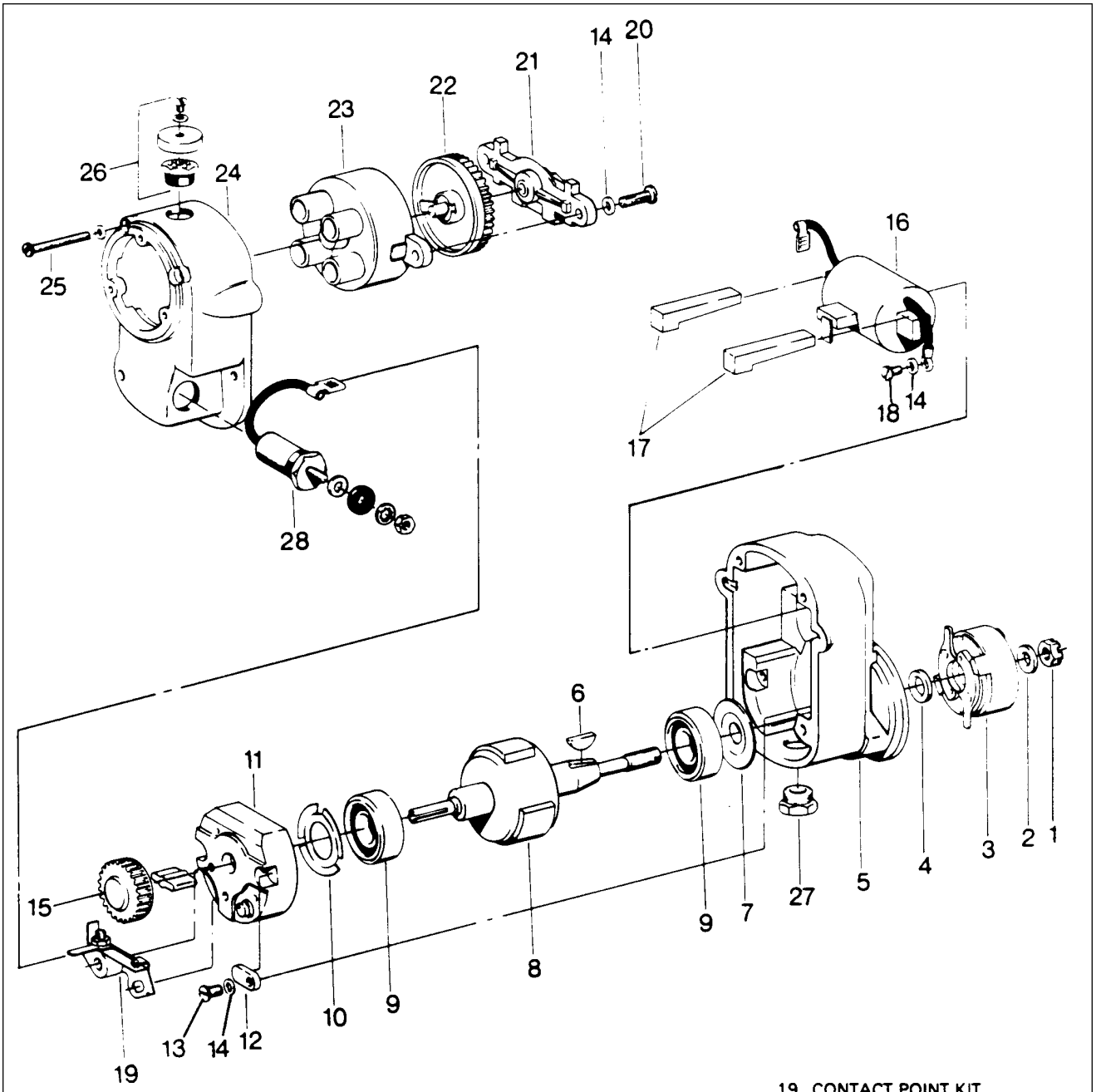


Figure 74-3. Exploded View of 4200 Series Magneto

2. Cleaning And Inspection Of Magnetos

a. Inspect internal and external threads of all threaded hardware. Damaged or worn parts must be replaced.
b. Inspect bearing plate for excessive wear and damage. (Maximum bearing bore inside diameter (id) is 1.5752 inch.)
c. Check rotor for damaged or worn key way. Check rotor bearing surfaces for wear. (Minimum outside diameter (od) is 0.6690 inch.)
d. Inspect magneto frame and distributor housing for cracks or other damage. Check bearing bore in drive end frame for wear. (Maximum id is l.5741 inch.)
e. Clean all parts thoroughly with grease solvent before assembly.

— CAUTION —

No structural repairs are permissible. Replace all items showing wear, damage, or that are not within specified tolerance.

3. Assembly Of Magnetos (Refer to Figures 74-4 thru 74-7.)

— CAUTION —

The following MUST BE REPLACED at overhaul on 4200 series magnetos: Nine thick washers, one condenser, one distributor block, one bearing bar, two ball bearings, one distributor gear, one coil, one retaining washer, one loading spring, one impulse coupling, oil seal, one contact point kit, and one rotor gear. Refer to Slick Parts List for part numbers.

— NOTE —

Before using slick T-100 assembly and timing tool, align index plate (bottom of tool) to number 67 to time magneto. (Refer to Figure 74-4.)

a. Loosen screws and align number 67 with mark on tool base.
b. Tighten screws and check alignment. Reverse tool.
c. Place frame on T-100 assembly and timing tool. Insert coil into frame; make sure it is against the stops. Insert coil wedges between bridge and frame.
d. Drive the two wedges tight, (use hammer and flat punch). Attach white ground wire of coil to frame, (use screw and lock washer). Tighten to a torque of 20 inch-pounds.
e. Check vertical portion of the high Tension lead of coil. Make sure it protrudes 1/16 of an inch beyond frame face. This gives spring pressure against the thrust bearing in distributor block.
f. Insert base plate (T-117) and adapter plate bushing (T-119) into base of T-100 assembly and timing tool. Assemble both ball bearings on rotor shaft, making sure grease shield of each bearing is toward magnet. Place rotor shaft into base plate, threaded end down. (See Figure 74-5.) Using bearing assembly plug (T-101), turn T-screw down until both bearings are seated tightly against shoulder on rotor shaft. Remove base plate (T-117) and adapter plate bushing (T-l19).
g. Assemble bearing retaining washer into frame (raised side against frame). Place loading spring into bearing plate flat side down.
h. Assemble by hand rotor shaft with bearings (cam slot end) into bearing plate, making sure it is square on bearing.

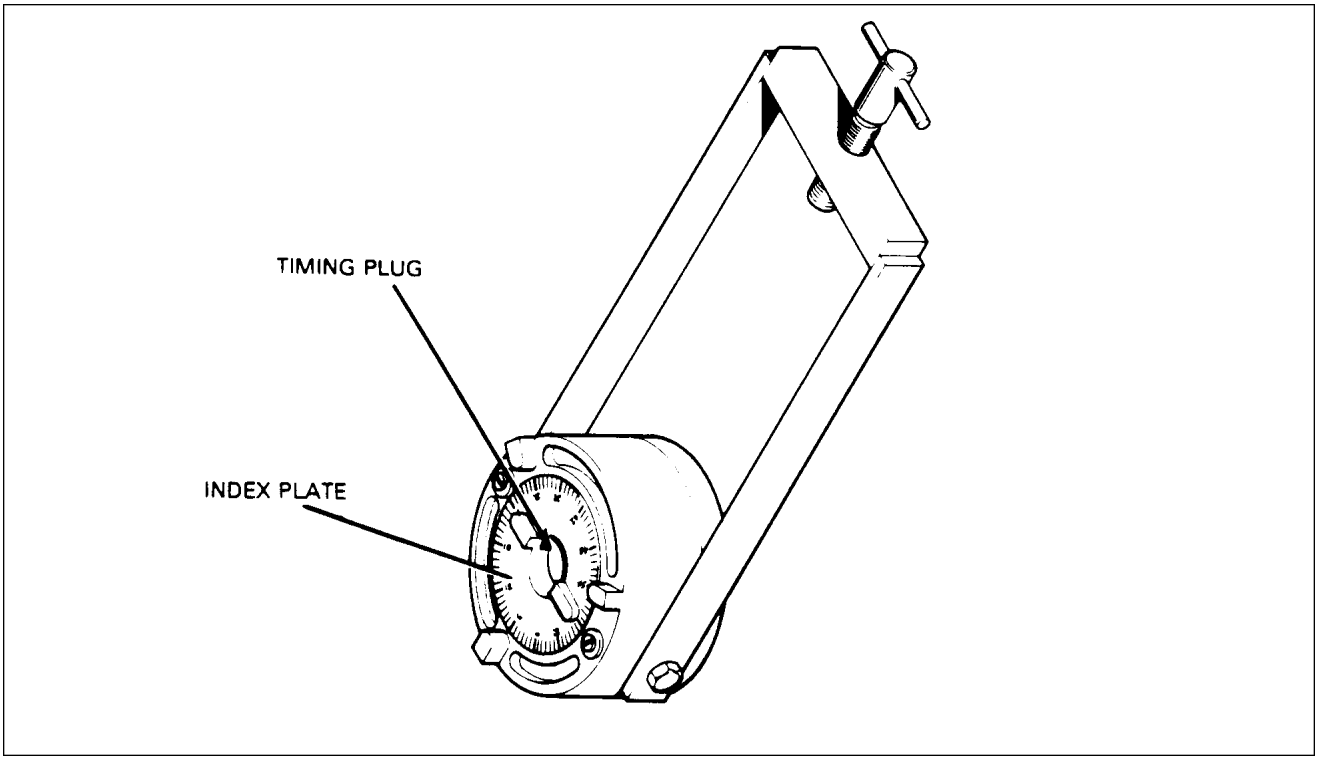


Figure 74-4. Index Plate and Timing Plug

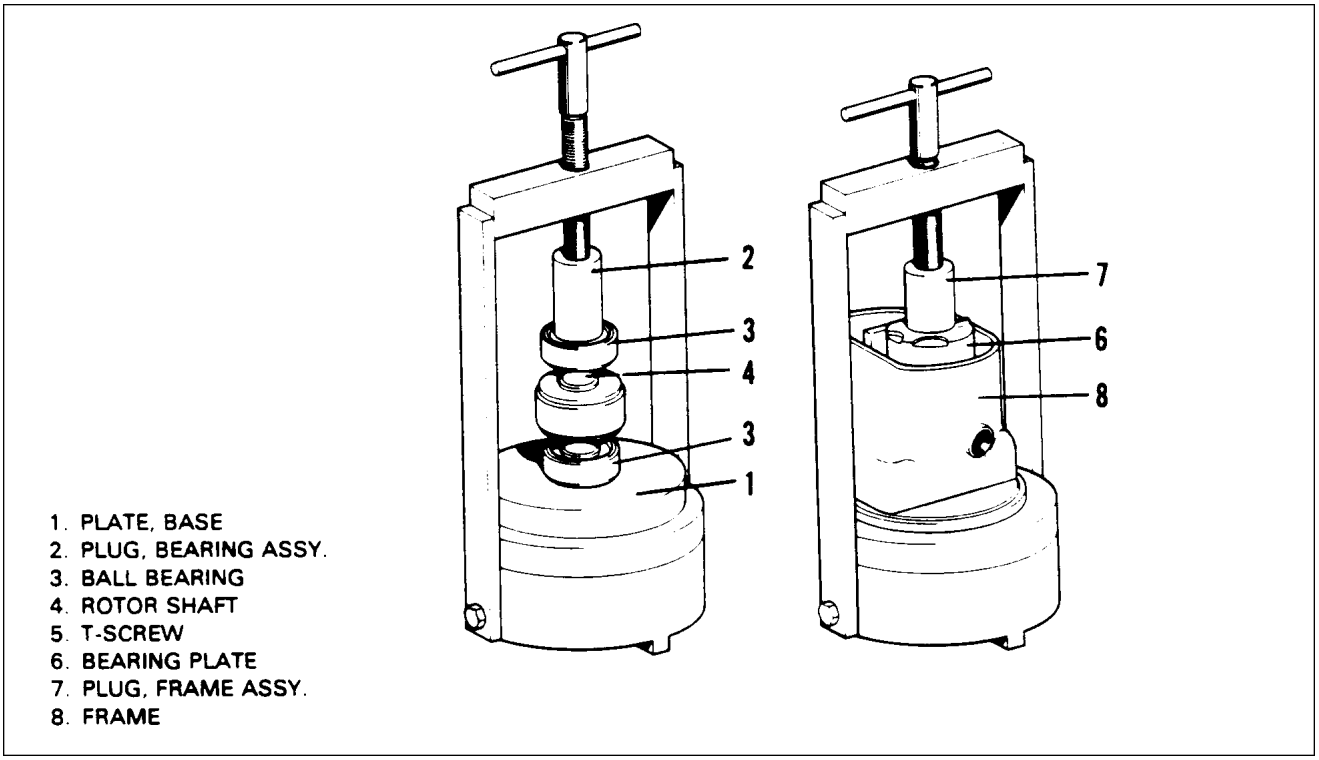


Figure 74-5. Installation of Bearings and Bearing Plate

i. Using rotor and frame assembling plug (T-102), turn T-screw down until plate bottoms in frame. (Refer to Figure 74-5.) Install bearing plate clamp on bearing plate, install screw, and lock washer. Tighten to a torque of 20-24 inch-pounds.
j. Reverse magneto on T-100 assembly and timing tool so flange of magneto is facing up. (Refer to Figure 74-6.)
k. Lubricate oil seal with light grease and assemble seal over end of rotor shaft. Using oil seal assembling plug (T-103), turn T-screw to press seal flush with frame of magneto.
l. Assemble woodruff key into key slot of rotor shaft.
m. Install impulse coupling assembly on shaft, and tighten nut. Tighten to a torque of 120 to 300 inch-pounds, so coupling is properly seated on taper shaft, and install cotter pin. Check to see coupling is free by snapping it through 3 or 4 times.

— NOTE —

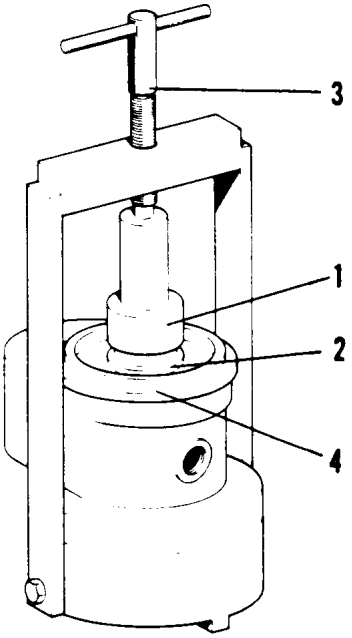
Wait until magneto is timed before installing gear, then install cotter pin.

n. Assemble contact point kit on bearing plate using screws from kit. Insert cam in cam slot with screwdriver blade, and tap with light hammer. Drive cam all the way to bottom of cam slot. Apply M-1827 cam grease sparingly to each lobe of cam before assembly.
o. Assemble rotor gear onto rotor, making sure key slot of gear fits into cam slot of rotor. Tap with light hammer until gear bottoms on shaft.
p. To time magneto internally, place magneto on T-100 assembly and timing tool base and make sure coupling lugs are in slots of index plate. Swing frame counterclockwise against pin which will line up rotor and cam for E gap position.
q. Attach either red or green wire of timing light to bronze point terminal and black wire to frame of magneto. (Refer to Figure 74-7.) With a screwdriver, adjust points so timing light indicates point openings and points open. Secure points by tightening screws. This gives a point gap of 0.008-0.010 inch. Attach coil wire to vertical bronze male terminal of point assembly.
r. Assemble condenser into distributor housing, carefully rotate condenser wire in same direction as condenser is tightened in housing. Tighten to a torque of 110 inch-pounds. Assemble distributor gear in distributor block, with L and R facing you. Assemble bearing bar to distributor block so open side of dust collector is toward air vent and hood. Assemble distributor block in distributor housing, with cut-away toward condenser. Use screws and lock washers. Tighten to a torque of 18-20 inch-pounds.

— CAUTION —

Do not bend the high tension lead of the coil.

s. Connect condenser wire to slip terminal on point assembly. Align L or R (depending on magneto rotation) on rotor gear so it points toward high tension lead of coil.
t. Align L or R on distributor gear with L or R on distributor block and insert timing pin (T-118) through block into gear.
u. Fit distributor housing to frame, making sure bosses of distributor housing are seated in slots of frame. Start by fitting top boss (next to vent) and assemble distributor housing into place.
v. Secure distributor housing to frame with four screws and four lock washers. Tighten to a torque of 24 inch-pounds and remove timing pin.



1. PLUG, OIL SEAL ASSY.
2. OIL SEAL
3. T-SCREW
4. FLANGE

Figure 74-6. Magneto Oil Seal Installation on T-100

1. TIMING LIGHT
2. WIRE, RED OR GREEN
3. WIRE, BLACK GROUND
4. VENT

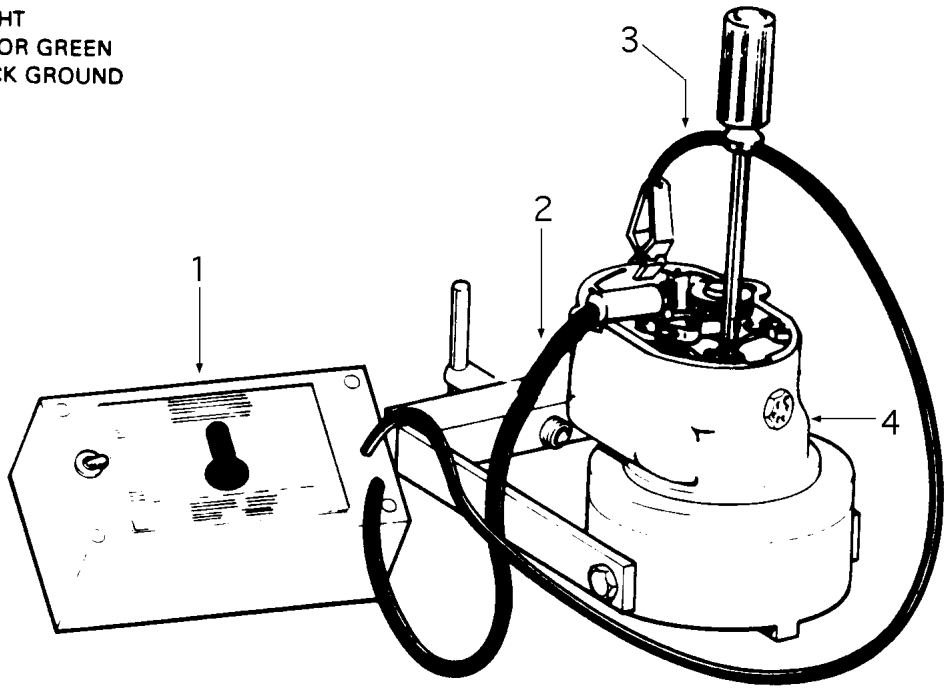


Figure 74-7. Magneto Internal Timing

4. 4200 Series Magnetos Internal Timing Procedure

When installing new or adjusting breaker points and before timing magneto to engine, internal timing of magneto must be correct. Find number one tower, as follows:

— NOTE —

No need to spark out these magnetos.

a. Insert T- 118 timing pin in L or R hole in distributor block (depending on rotation of magneto).
b. Turn rotor opposite rotation of magneto until pin engages gear.
c. If pin is binding and will not go in hole in gear, you have hit the pointer on the gear. Pull pin out. enough to continue opposite rotation until pointer has passed, re-insert pin.
d. When pin sticks through hole in gear about 1/4 inch, number one cylinder is ready to fire.
e. After magneto is installed, remove timing pin. Magneto is ready to be timed to engine.

5. 4200 Series Magnetos Installation And Timing Magneto to Engine Procedure

Install magnetos and time to engine as follows:

— WARNING —

Be sure switch is in OFF position and P lead is grounded

a. Remove top spark plug from number one cylinder. Place a thumb over spark plug hole and turn engine crankshaft in normal direction of rotation until compression stroke is reached. (Compression stroke is indicated by positive pressure inside cylinder tending to lift thumb off spark plug hole.) In this position both valves of number one cylinder are closed. Turn crankshaft opposite to its normal direction of rotation until it is approximately 35 degrees btdc on compression stroke of number one cylinder. Rotate crankshaft in its normal direction of rotation until 25 degrees mark on starter ring gear and hole in starter housing align.
b. Insert T-118 timing pin in L or R hole in distributor block. Turn rotor opposite rotation of magneto until pin engages gear, install magneto and gasket on mounting pad of accessory housing, and remove timing pin. Tighten bolts finger tight.
c. Connect standard timing light between engine ground and left magneto condenser terminal. Switch must be ON.
d. Rotate complete magneto opposite normal rotation of magneto on engine mounting until timing light indicates contact breaker points are just opening. Secure magneto in this position. Turn switch OFF.
e. Turn on timing light switch. Turn crankshaft very slowly in direction of normal rotation until timing mark on front face of starter ring gear aligns with drill hole in starter housing. Light must come on (on battery operated models). If not, turn magneto in its mounting flange slots and repeat procedure until light goes on at 25 degrees before top dead center. Tighten the two mounting bolts.
f. Connect the other positive wire of timing light to right magneto condenser terminal and time the magneto the same as left magneto.
g. After both magnetos have been timed, leave timing light wires connected and check magneto timing as described to make sure magnetos are set to fire together. If timing is correct, both timing lights will come on simultaneously when 25 degree mark on ring gear aligns with drill hole in starter housing. If points open early, loosen mounting bolts and rotate magneto counterclockwise. Secure bolts and remove timing lights.

F. Bendix Magneto

— CAUTION —

Magneto service instructions in this manual cover minor repairs and timing. For further repairs and adjustments of magnetos, follow manufacturer's service instructions.

— CAUTION —

Ascertain that primary circuits of both engines are grounded before working on engine.

1. Inspection Of Magnetos

At engine inspection or when magneto is removed from engine, check as follows:

a. Inspect distributor block contact springs. Top of spring must not be more than 0.422 inches below top of tower as shown in Figure 74-9. If broken or corroded, they must be replaced.
b. Inspect oil felt washer. It must be saturated with oil. If dry, check for worn bushing. If ok, add no. 30 oil.
c. Inspect distributor block for cracks or burned areas. Wax coating on block must not be removed. Do not use solvents
d. Look for excess oil in breaker compartment. If present, check for a bad oil seal or oil seal bushing at drive end. Check manufacturer's overhaul procedures.

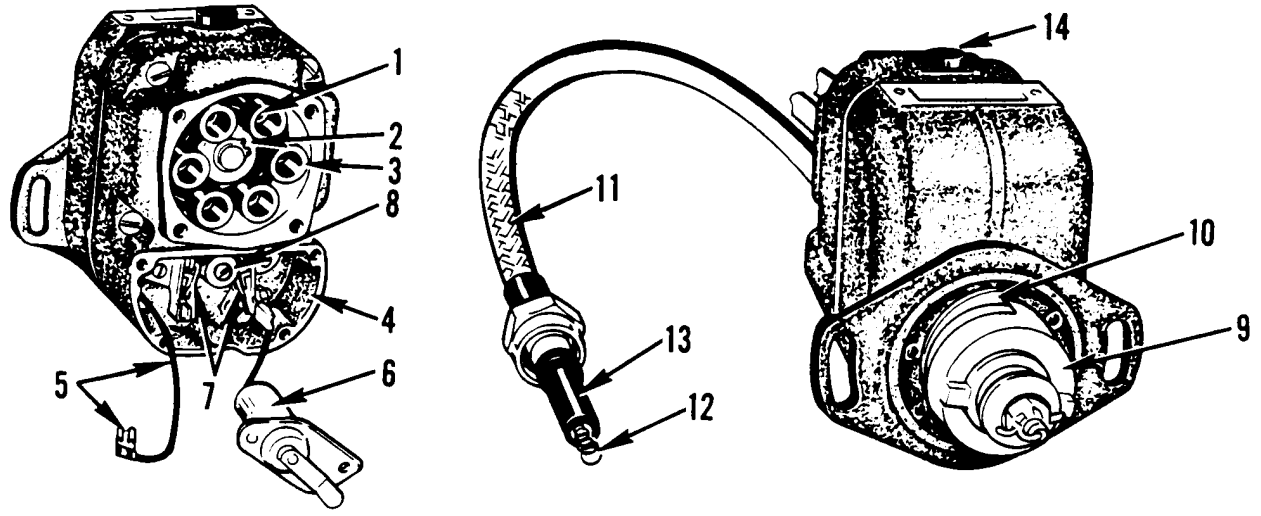


Figure 74-8. Bendix Magneto Inspection

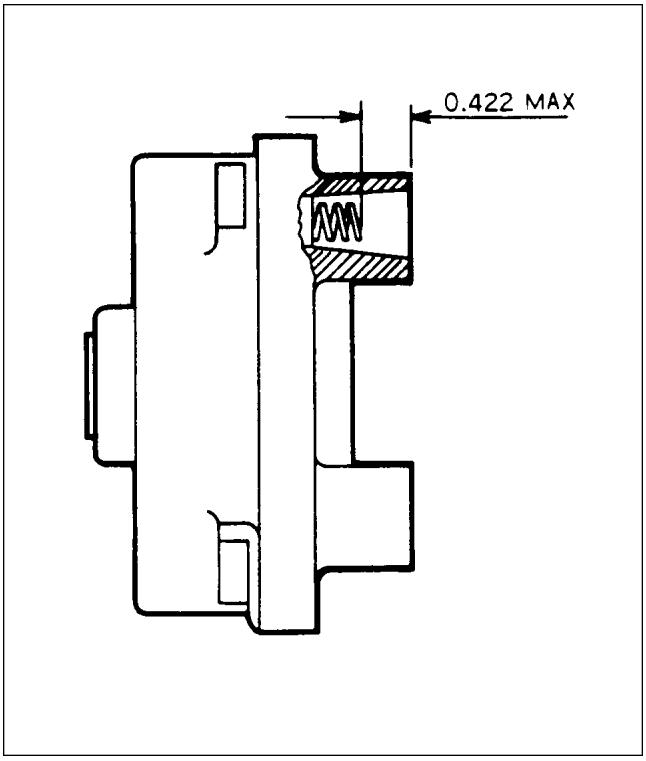
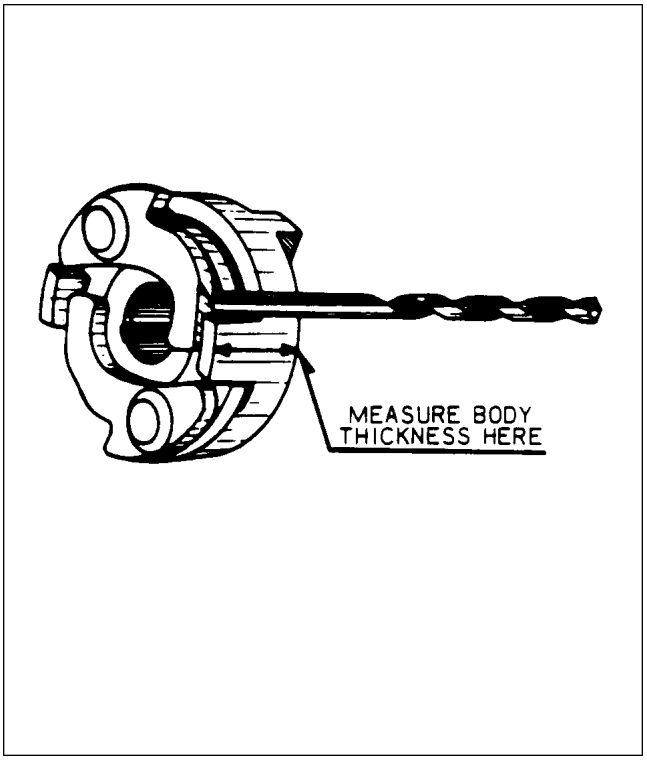


Figure 74-9. Contact Spring Inspection



74-10. Impulse Coupling

e. Look for frayed insulation or broken wire strands in leads in back of magneto. Make sure terminals are secure. Make sure wires are in proper position.

f. Inspect capacitor visually. Test for leakage, capacity, and series resistance. Electrical failure of capacitor is rare.

g. Adjustment of breaker must be correct for proper internal timing of magneto. (Refer to Timing Procedure.)

h. Check breaker cam is clean and smooth, and cam screw is tight (25 inch-pounds). If new points are installed, blot a little oil on cam.

i. Inspect pulse coupling (-21 and -204 magneto) flyweights for excessive looseness on axles. Design couplings have 0.927 inch thick body and must be checked with 1/8 inch drill. Couplings with 0.974 inch thick body are checked with a no. 18 drill. If drill fits between cam and flyweight, fit is too loose and coupling must be replaced. (Refer to figure 74-10.)

j. Check impulse coupling for excess wear on contact edges of body and flyweights.

k. Check impulse coupling flyweight axle rivets are tight and there are no cracks in body.

l. Check lead conduits. If the insulation looks worn, replace. Special high temperature coating on lightweight harnesses is for vibration resistance and mechanical protection. Harness integrity is not sacrificed if small areas of braid show peeling or flaking of coating.

m. Check springs for breaks, corrosion, or deformation. Check continuity from block with tester or light.

n. Check insulators for cracks, breaks, or evidence of aging. Be sure they are clean.

o. Timing and ventilator plugs. Ventilator has drilled holes and must be in lowest hole in magneto to drain excess water or oil. Solid plug is used in other hole or in location exposed to rain or water.

2. Removal Of Magneto

— WARNING —

Magneto is not internally grounded. When ground lead is dis - connected, magneto is hot. Removing harness assembly terminal plate first and installing them last, minimizes danger of starting engine accidentally when ground lead is removed from magneto.

— WARNING —

Before removing magneto, make sure magneto switches are OFF.

a. Remove harness assembly terminal plate from magneto.
b. Disconnect ground lead at magneto.
c. Remove nuts and washers and draw magneto from engine.

3. -20 and -200 Series Magnetos Internal Timing Procedure.

When adjusting or installing new breaker points and before timing magneto to engine, make sure internal timing of magneto is correct.

a. To internally time -20 series and early -200 series magneto without cast timing marks, magneto must be removed from engine to determine E gap.
b. To determine E gap, rotate drive coupling in direction of normal rotation until red or white chamfered tooth on distributor drive gear shows through timing inspection hole. Turn back until magnet locates in its neutral position.
c. With timing plate and pointer attached (Refer to Figure 74-12.) and pointer set at zero, rotate coupling from neutral in normal direction of rotation 10 degrees. Look through timing hole, align red (or white) gear tooth with white line of distributor block. (Refer to Figure 74-11.) Alignment may not vary over ±4 degrees.

— NOTE —

A timing kit, including timing plate, etc., may be purchased from the engine or magneto manufacturer. Pointer may be formed as per Figure 74-12. Pointer can also be made by wrapping a piece of soft wire tightly around head of cam securing screw and bending it to extend over timing marks.

d. Using alignment of gear marked with white line of distributor block as a reference, adjust breaker points to open at this point. Turn magneto drive until cam follower is on high point of cam lobe. Measure contact clearance, it must be 0.018 inch ±0.006 with E gap set 10 degrees ±4 degrees. If breaker points do not come within tolerances, they must be replaced.
e. If magneto cast in timing marks (-200 series, see Figure 74-14), main breaker can be adjusted with magneto on engine as follows: turn engine crankshaft until notch in cam aligns with mark at top of breaker compartment. Set wire pointer in center of E gap boss at side of breaker compartment. Connect timing light across main breaker. Adjust main breaker contacts to open at this point. Turn engine crankshaft until cam follower is on high point of cam lobe. Measure contact clearance. It must be 0.018 inch ±0.006. If necessary, adjust breaker and check contacts will open while E gap tolerance is ±4 degrees. (Width of E gap boss.)

— CAUTION —

If cam screw is removed, replace flat washer, lock washer, and screw. Tighten to a torque of 25 inch-pounds.

f. With internal timing checked, time magneto to engine.

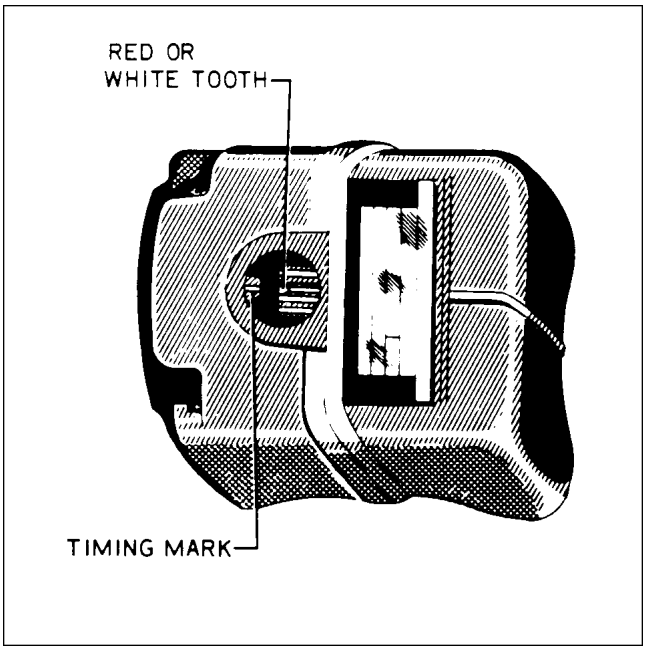


Figure 74-11. Magneto Timing Marks

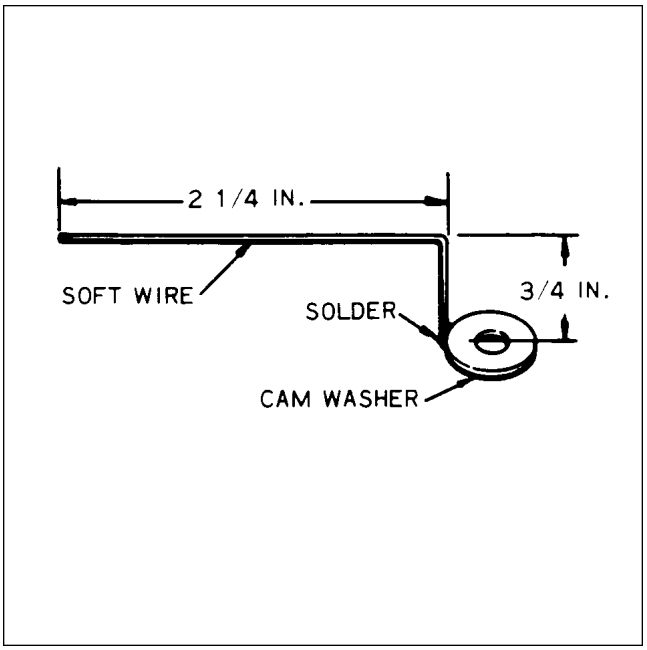


Figure 74-12. Timing Pointer

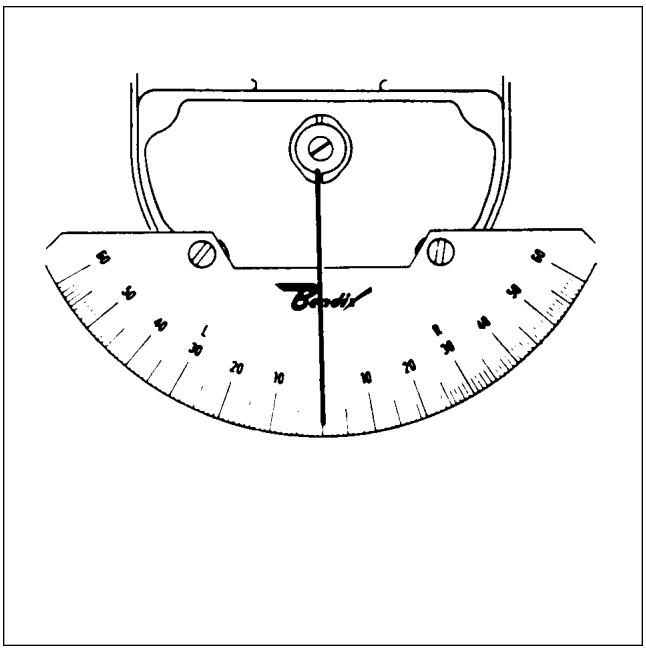
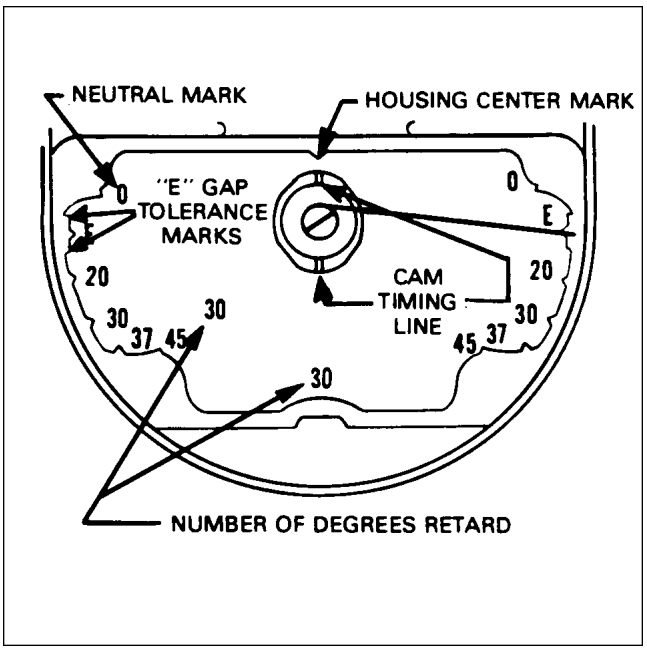


Figure 74-13. Timing Kit Installed



74-14. Breaker Compartment with Cast Timing Marks

4. Installation and Timing Magneto to Engine Procedure

— CAUTION —

Do not rotate crankshaft more than 10 degrees in direction opposite normal rotation as pawl on impulse coupling will engage stop pin and late timing will be indicated through impulse coupling mechanism. If this happens, rotate crankshaft in normal direction until sharp click is heard; this will indicate that impulse coupling has passed through firing position. Turn crankshaft in direction opposite normal rotation to approximately 35 degrees btc and proceed with timing check.

Install and time magnetos to engine as follows:

— NOTE —

Make sure that breaker are correct for proper internal timing of magnetos.

a. Remove top spark plug from no. one cylinder. Place thumb of one hand over spark plug hole and rotate crankshaft in direction of normal rotation until compression stroke is reached. Compression stroke is indicated by a positive pressure inside cylinder tending to lift thumb off spark plug hole. In this position both valves of no. one cylinder are closed. Turn crankshaft opposite to its normal direction of rotation until it is approximately 35 degrees btc on compression stroke of no. one cylinder. Rotate crankshaft in its normal direction of rotation until 25 degrees mark on starter gear and crankcase parting flange or index on front of starter housing are aligned.

b. Rotate magneto gear on right magneto until chamfered tooth on distributor gear (inside magneto) aligns with white pointer as seen through window in magneto cover. Do not allow gear to turn from this position, assemble magneto and gasket. Secure magneto in place with washers and nuts; tighten nuts only finger tight.

c. Fasten ground wire on electric timing light to any unpainted metallic portion of engine, and one of the positive wires of timing light to a suitable terminal connected to ground terminal connection of right magneto. Turn engine crankshaft several degrees from btc in direction opposite that of normal rotation.

d. Turn on timing light switch. Turn crankshaft very slowly in direction of normal rotation until timing mark on front face of ring gear support aligns with drilled hole in starter, at which point light should go on, (on battery operated models). If not, turn magneto in its mounting flange slots and repeat procedure until light goes on at 25 degrees before top dead center. Tighten two mounting nuts and replace magneto inspection plug.

— CAUTION —

Impulse coupling magneto can be used only on left side of engine (viewed from rear).

e. Install impulse coupling magneto adapter and gasket on left magneto mounting pad of accessory housing.

f. Remove inspection plug, depress pawl on impulse coupling shaft, and turn impulse on left magneto until white beveled tooth (or middle tooth, if timing gear has three beveled teeth) aligns with the timing pointer. Without allowing magneto gear to turn from position, assemble left magneto to accessory housing and secure with washers and nuts. Tighten nuts only finger tight.

g. Connect other positive wire of timing light to a suitable terminal connection of left magneto and time magneto in same manner as for right magneto.

h. After both magnetos are timed, leave timing light wires connected and check magneto timing as previously described to make sure that both magnetos are set to fire together. If timing is correct, both timing lights will go simultaneously when 25 degree mark aligns with centerline of crankcase. If breaker points open too early, loosen mounting nuts and rotate magneto clockwise. If breaker points open too late, rotate magneto counter clockwise. Remove timing light and ignition timing pointer, and replace timing inspection plug in magneto.

i. After magnetos are properly timed, clean breaker points to remove any trace of oil or dirt. Replace breaker cover and lock retaining screws together with lockwire.

ARCHER III

For information on servicing Slick magnetos used on the Archer III, refer to the Master Service Manual, p/n F1100. This manual is available on a subscription basis from: ***Unison Industries, 530 Blackhawk Park Avenue, Rockford, Illinois 61161, telephone number: (815) 965-4700.***

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

DISTRIBUTION

A. Harness

1. Inspection Of Harness

a. Check lead assemblies for nicks, cuts, mutilated braiding, badly worn section or any other evidence of physical damage. Inspect spark plug sleeves for chafing or tears, and damage or stripped threads on coupling nuts. Check compression spring is not broken or distorted. Inspect grommet for tears. Check all mounting brackets and clamps to see that they are secure and not cracked.

b. Use an ohmmeter, buzzer, or other suitable low voltage device, and check each lead for continuity. If continuity does not exist, wire is broken and must be replaced.

c. For electrical test of harness assembly, use high voltage, direct current tester such as TAKK model 86 or 86A or equivalent direct current high voltage tester capable of delivering test potential of 10,000 volts. Connect ground lead to high voltage tester to outer shielding braid of a single lead. Connect plug terminal. Turn tester ON and apply 10,000 volts. Insulation resistance should be 100 megohms minimum. Check all other harness leads in same manner.

d. Minor repair to harness assembly, such as replacement of contact springs, spring retainer assemblies, insulating sleeves, or of one lead assembly, is done with harness assembly mounted on engine. To replace more than one lead assembly or cable outlet plate, harness should be removed from engine and sent to an overhaul shop.

2. Removal Of Harness

a. Disconnect clamps holding wires to engine and accessories.

b. Loosen coupling nuts at spark plugs and remove insulators from spark plug barrel well. Do not damage insulator spring when withdrawing insulator.

c. Place a guard over harness insulators.

d. Remove harness assembly terminal plate from magneto.

e. Remove harness from airplane.

3. Disassembly Of Harness

a. To remove spring, Slick M-1455, from damaged lead, turn spring counterclockwise while pulling gently. This will remove spring and M-1498 electrode screw from end of coiled conductor.

b. To separate spring and screw, hold electrode screw with pliers and turn spring clockwise until it is through the threaded portion.

c. Remove insulator sleeve from end of wire.

d. To remove lead from M-1569 plug wire housing, use diagonals or cutting pliers and cut lead off close to housing. Use drift or punch to tap ferrule loose from housing.

— NOTE —

Further service on Slick harness will require the use of Slick M-1495 Service Tool Kit, obtained from:

Unison Industries.
530 Blackhawk Park Avenue
Rockford, Illinois 61161

Island Enterprises

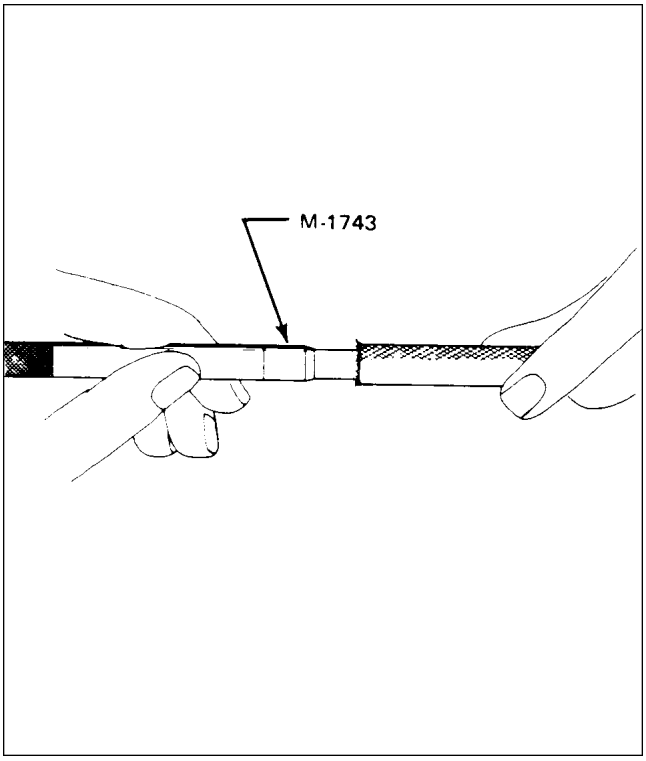


Figure 74-15. Stripping Tool

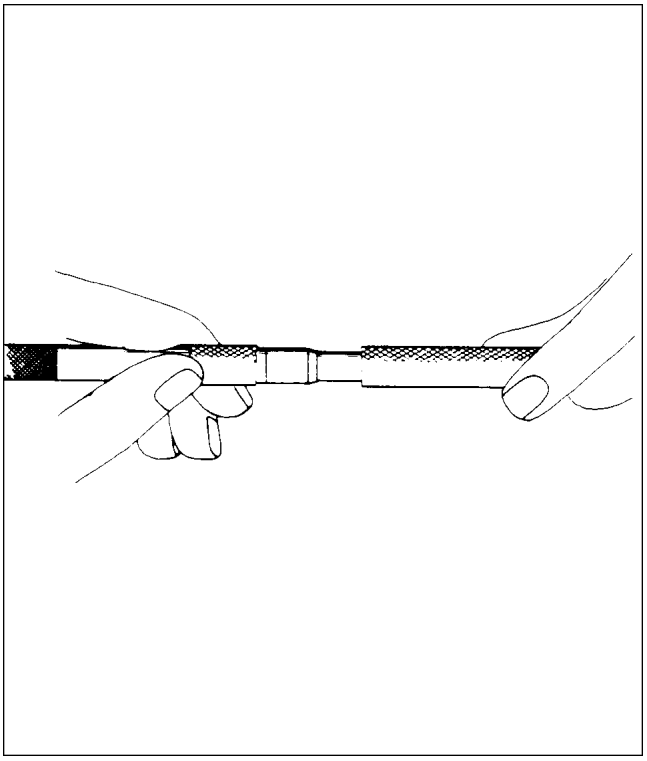


Figure 74-16. Inserting Stripping Tool

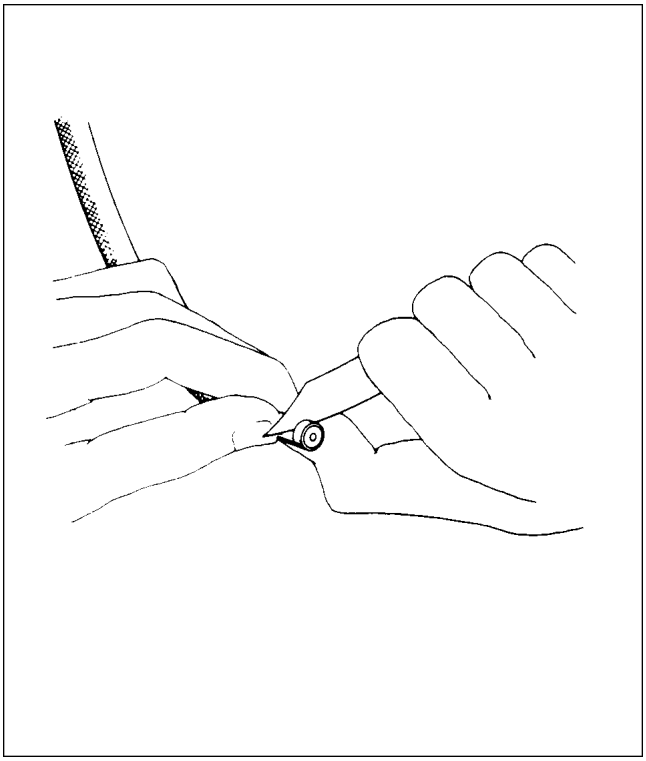


Figure 74-17. Cutting Insulation

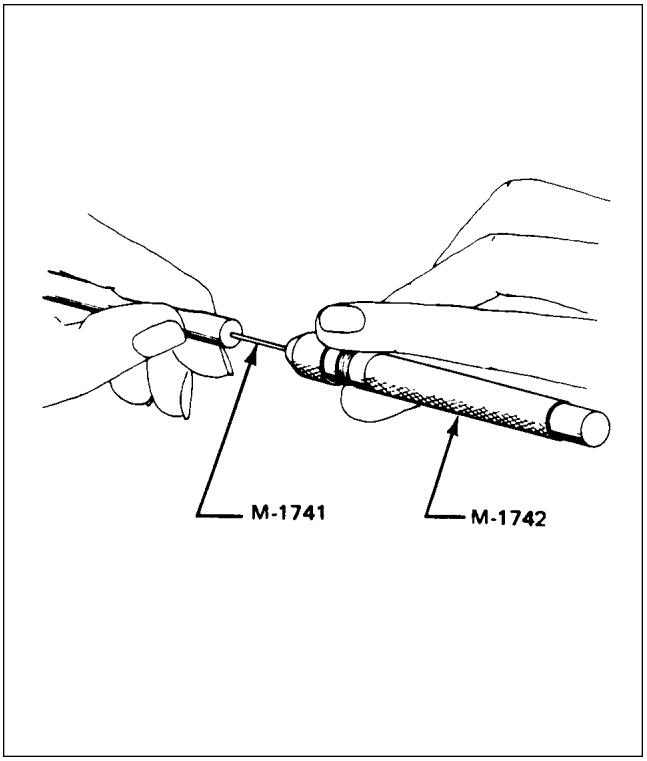


Figure 74-18. Removing Silicone Rubber from Wire

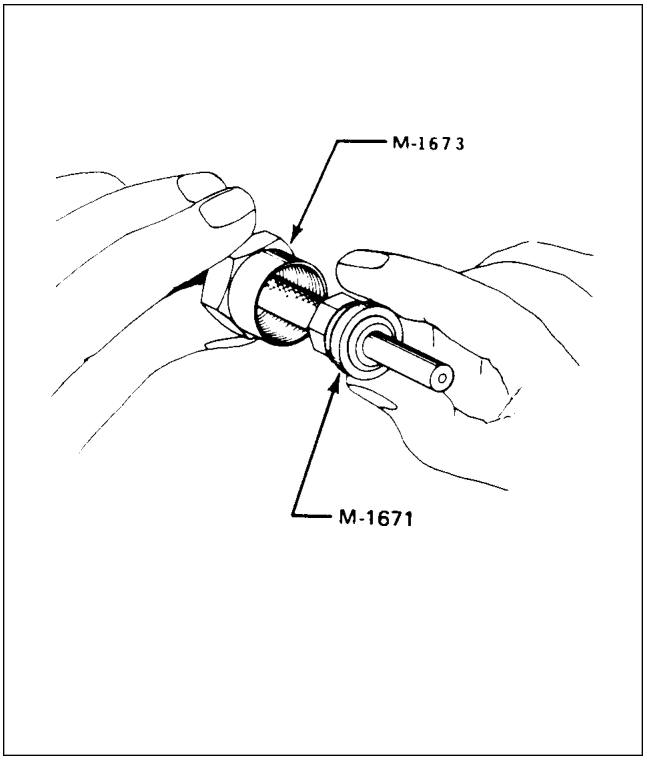


Figure 74-19. Installation of Plug Endnut

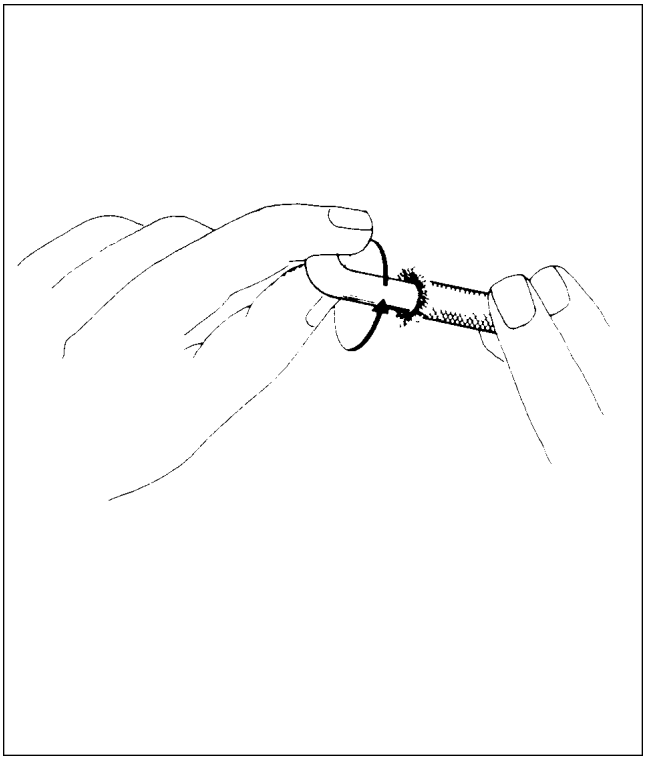


Figure 74-20. Flaring out the Shielding

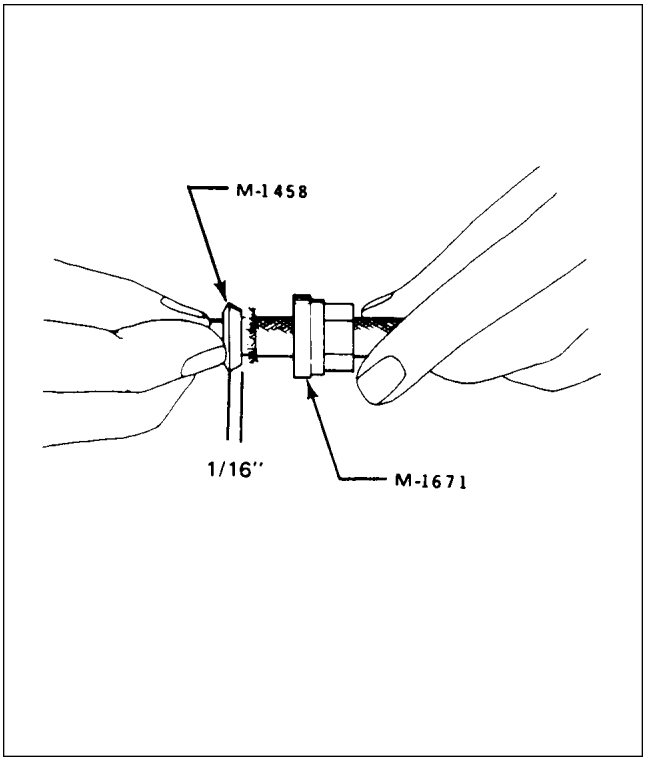


Figure 74-21. Installation of Ferrule

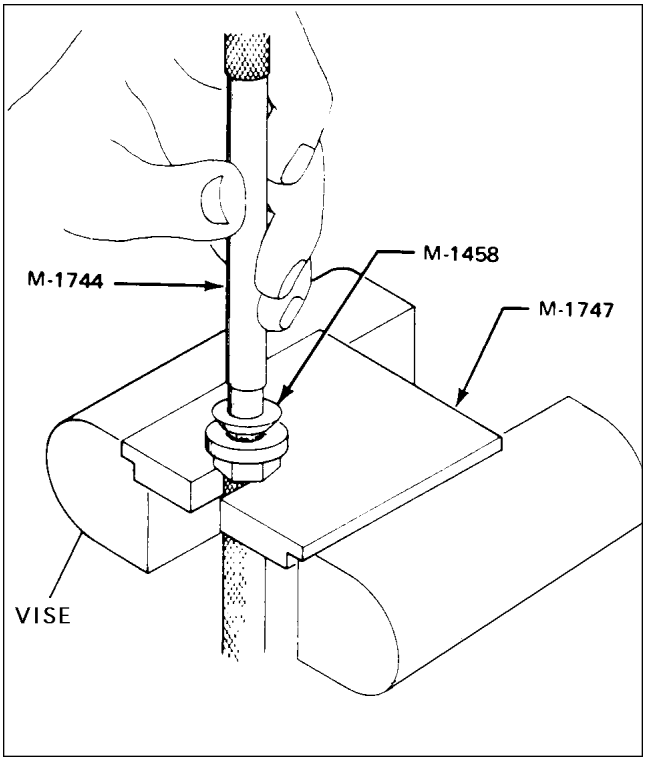


Figure 74-22. Driving Tool

4. Harness Assembly Instructions

a. Cut a piece of harness wire to length required. Do not stretch wire when measuring it.
b. On magneto end, make a final mark 0.75 inch (0.562 for Bendix magneto) from wire end. A 0.937 inch mark must be made from spark plug end of wire.
c. Flare out shielding, then without allowing any shielding to fold under, insert Slick M-1743 stripping tool under braided shielding. Refer to Figure 74-15.
d. Make sure stripping tool is inserted past cutting mark, and cut shielding with a sharp knife using a rolling motion. Remove shielding and stripping tool. Do not cut silicone insulation. Refer to Figure 74-16.
e. Cut exposed insulation 0.062 inch (0.125 inch for Bendix magneto) back from end and roll insulation clockwise to remove. Do not pull insulation off wire. Trim end of coiled conductor to make a clear hole for inserting stud. Refer to Figure 74-17.
f. Using M-1742 pin vise, insert M-1741 drill (72 drill), drill out silicone rubber from inside coiled conductor approximately 0.375 inch deep. Refer to Figure 74-18.
g. On spark plug end of wire install M-1673 nut followed by M-1671 female taper hex ferrule. Refer to Figure 74-19.
h. After installation of nut and ferrule, bend and rotate silicone insulation as per figure 74-20 to flare out shielding so drive ferrule can be inserted. Do not cut silicone insulation with sharp braiding while wire is being rotated. Refer to Figure 74-20.

— CAUTION —

Do not reuse the M-1458 drive ferrule.

i. On spark plug end of wire install M-1458 male tapered drive ferrule over silicone insulation and under shielding to within 0.062 inch from flange of ferrule. Make sure that shielding is away from ferrule flange then slide ferrule M-1671 over the M-1458 drive ferrule until tight. Refer to Figure 74-21
j. For spark plug end, mount M-1747 drive plate in a bench vise. Set hex ferrule in drive plate slot. Drive M-1458 drive ferrule flush against the hex ferrule using the M-1744 drive tool. Refer to Figure 74-22.
k. For magneto end of wire, insert wire through hole in M-1569 plug wire housing so shielding is through hole as shown in Figure 74-23.
l. Install an M- 1458 male tapered drive ferrule over insulation and under shielding as in step i, then drive ferrule into M-1569 housing using M-1744 drive tool, similar to step j. Refer to Figure 74-24.
m. Clamp threaded end of M-1498 electrode screw in M-1742 pin vise. Insert tapered pin of electrode screw into center of coiled conductor by turning pin vise counterclockwise and pushing at same time until screw is flush with insulation. This is done at both ends of the wire assembly. Refer to Figure 74-25.
n. On magneto end of wire, place M-1738 insulator sleeve (brown, 0.75 inch long) over silicone insulation. On spark plug end of wire, use green M-1677 insulator sleeve. Refer to Figure 74-26.
o. Turn M-1455 spring clockwise on electrode screw three full turns until end is flush with first large coil of spring. This applies to both ends of wire. Refer to Figure 74-27.

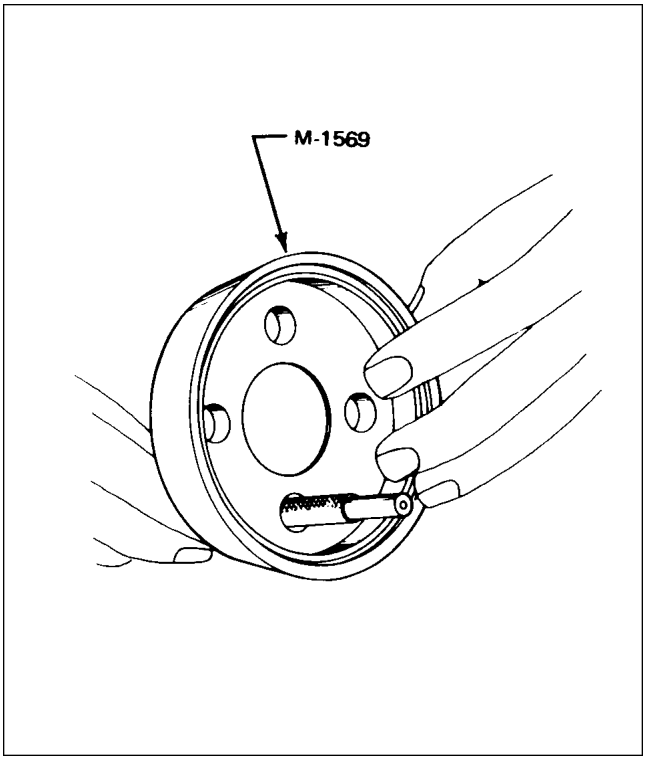


Figure 74-23. Insulation in Housing

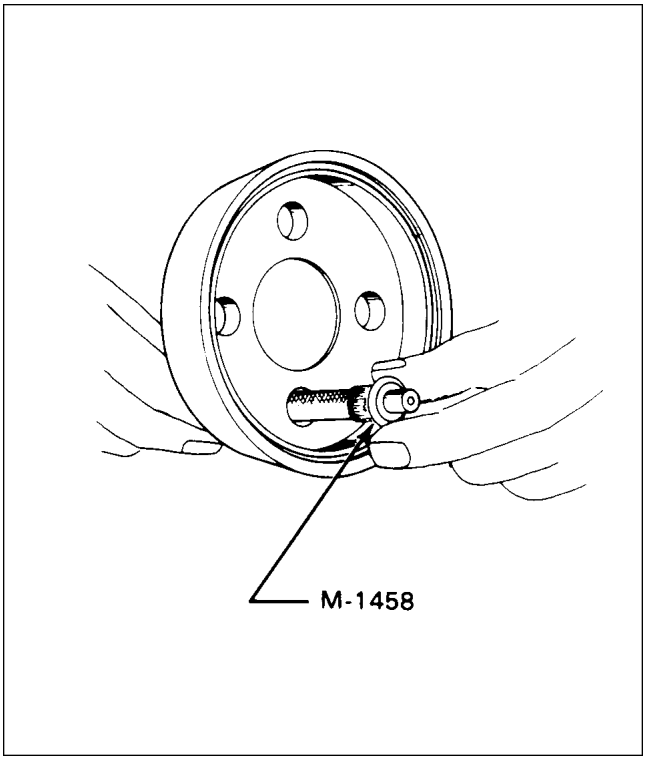


Figure 74-24. Securing Wire in Housing

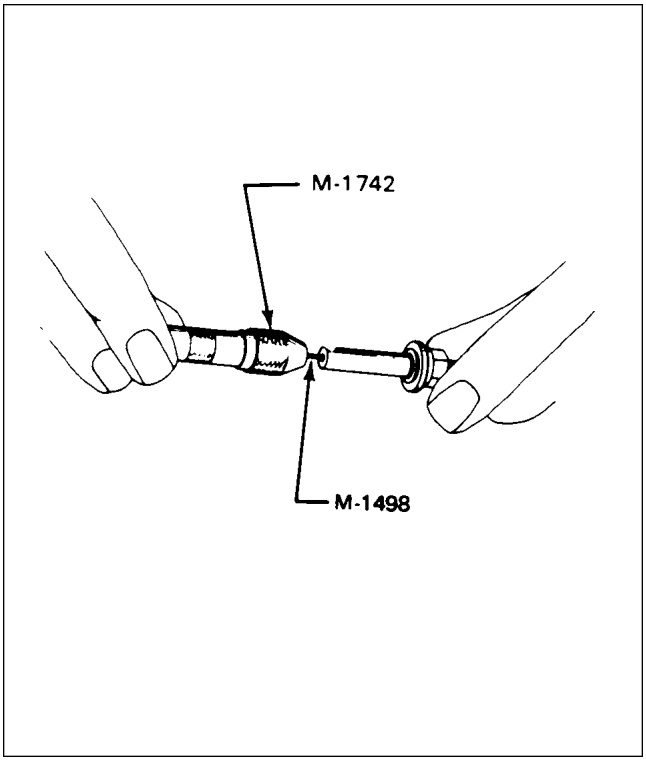


Figure 74-25. Installation of Electrical Screw

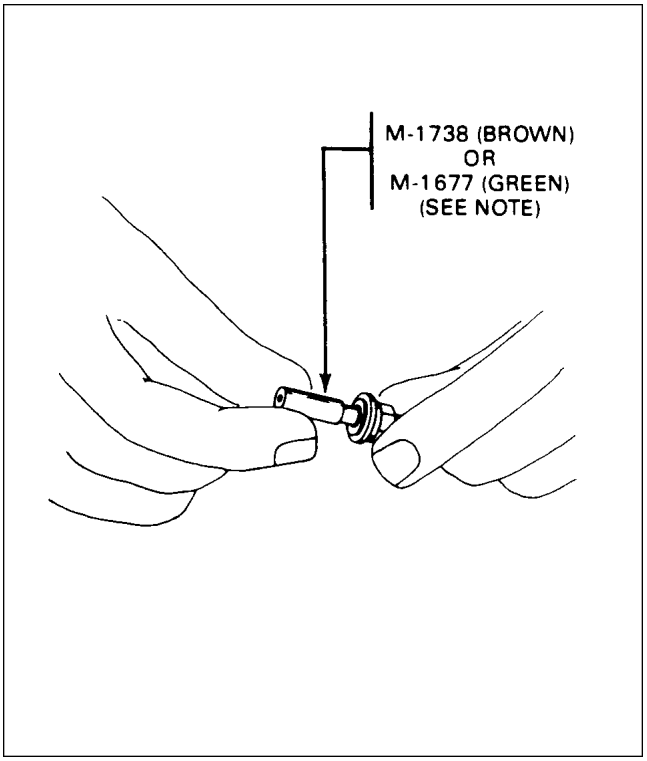


Figure 74-26. Installation of Insulator Sleeve

5. Installation Of Harness

Before installing harness on magneto, check mating surfaces for cleanliness.

a. Place harness terminal plate on magneto and tighten nuts around plate alternately to seat cover squarely on magneto.

—NOTE—

The left magneto is wired to fire all top spark plugs in this engine. The right magneto fires all bottom plugs.

b. Route ignition wires to their respective cylinders.
c. Clamp harness assembly in position and replace engine baffle plate.
d. Connect leads to spark plugs.

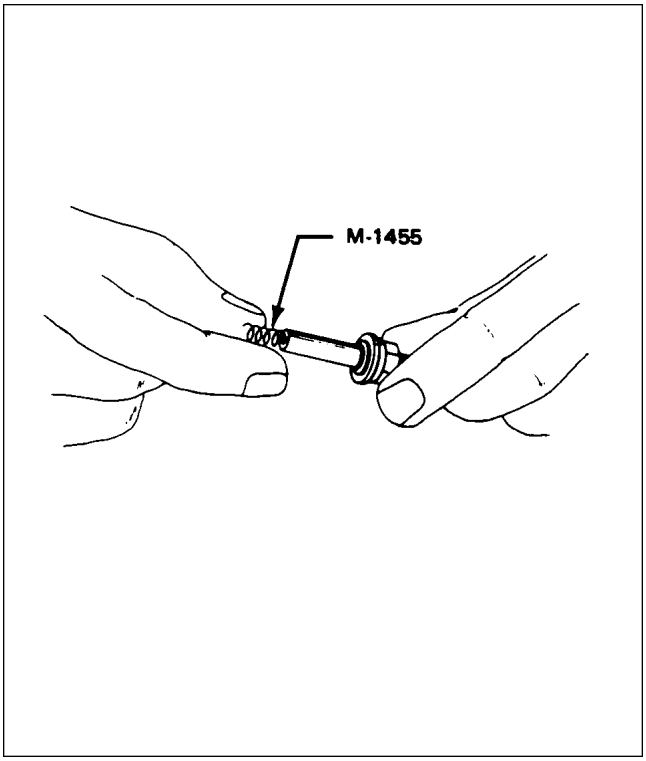


Figure 74-27. Installation of Spring

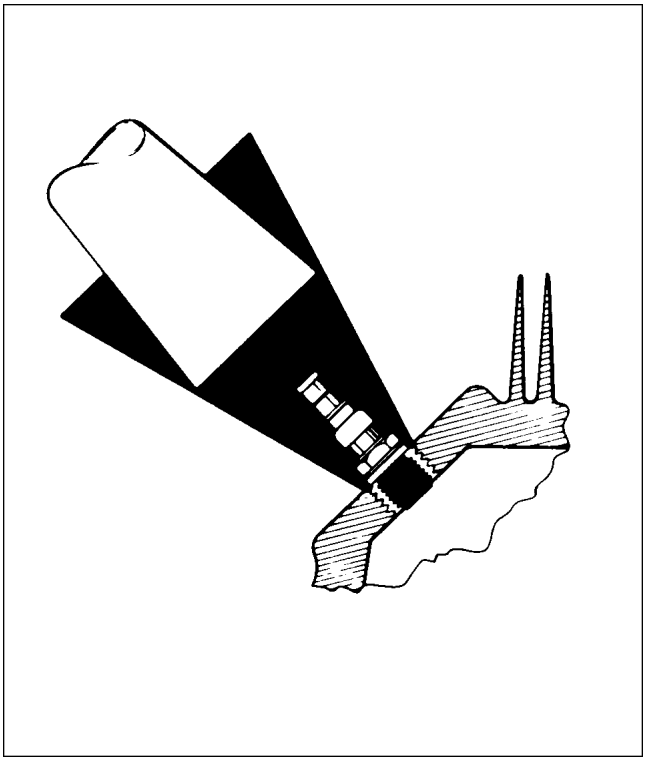


Figure 74-28. Removing Spark Plug Frozen to Bushing

B. Spark Plugs

1. Removal Of Spark Plugs (Refer to Figure 71-28.)

— CAUTION —

When withdrawing ignition cables lead connection from plug, carefully pull lead straight out and in line with center line of plug barrel; otherwise, a side load will be applied which fre - quently results in damage to barrel insulator and connector. A lead cannot be removed easily in this manner, resisting contact between neoprene collar and barrel insulator will be broken by a rotary twisting of collar. Avoid undue distortion of collar and possible side loading of barrel insulator.

a. Loosen coupling nut on harness lead and remove terminal insulator from spark plug barrel well.

—CAUTION—

Due to greater torque value requirements, torque wrenches should not be used to remove spark plug..

— CAUTION —

Do not allow foreign objects to enter spark plug hole.

b. Remove spark plug from engine.

In the course of engine operation, carbon and other combustion products are deposited on the end of spark plugs and will penetrate lower threads to some degree. As a result, a greater torque is required for removing a plug than for installation. Torque limitations given do not apply to plug removal, as sufficient torque must be used to unscrew plug. The higher torque required to remove plugs is not as detrimental as in installation, since it cannot stretch the threaded section. It does, however, impose a shearing load on this section and may, if sufficiently severe, produce a failure in this location.

c. Immediately upon removal, place spark plugs in a tray in a manner that will identify their position in the engine.

d. Removal of seized spark plugs in cylinder is done by application of liquid carbon dioxide (CO_2)by a conical metal funnel adapter with a hole at the apex just large enough to accommodate the funnel of a 20 lb bottle. (Refer to Figure 74-28.) When a seized spark plug cannot be removed by normal means, funnel adapter is placed over and around spark plug. Place funnel of CO_2 bottle inside funnel adapter and release carbon dioxide to chill and contract spark plug. Break spark plug loose with a wrench. A warm cylinder head at the time carbon dioxide is applied will aid in removal of excessively seized plug.

2. Inspection And Cleaning Of Spark Plugs

a. Visually inspect each spark plug for the following non-repairable defects.
   (1) Severely damaged shell or shield; threads nicked up, stripped, or crossthreaded.
   (2) Badly battered or rounded shell hexagons.
   (3) Out-of-round or damaged shielding barrel.
   (4) Chipped, cracked, or broken ceramic insulator portions.
   (5) Badly eroded electrodes worn to approximately 50 percent of original size.

b. Clean spark plug as required; remove carbon and foreign deposits.

c. Test spark plug both electrically and for resistance.

d. Set electrode gap at 0.017 to 0.021 inch.

3. Installation Of Spark Plugs

— CAUTION —

Do not install any spark plug that has been dropped.

Before installing spark plugs, make sure that threads within cylinder are clean and not damaged.

—CAUTION—

Make certain deep socket is properly seated on spark plug hexa - gon as damage to plug will result if wrench is cocked to one side when pressure is applied

a. Apply anti-seize compound sparingly on threads; install gasket and spark plugs. Tighten to a torque of 360 to 420 inch-pounds.
b. Carefully insert terminal insulator in spark plug and tighten coupling nut.

THIS SPACE INTENTIONALLY LEFT BLANK

Island Enterprises

THIS PAGE INTENTIONALLY LEFT BLANK

SWITCHING

IGNITION AND STARTER SWITCH(ES)

1. Removal of Ignition / Starter Switch.

a. Archer II

(1) Make sure ignition switch is in OFF position.
(2) Gain access to and disconnect power lead from battery.
(3) Remove retaining nut from switch and pull switch from back of instrument panel.
(4) Before removing wires from ignition switch note their location on switch.

b. Archer III — Removal of Starter Switch (Refer to Figure 74-30)

(1) Check that ignition switch is in OFF position.
(2) Disconnect (pull) STARTER & ACC. circuit breaker.
(3) Disconnect positive cable from battery.
(4) Drop the overhead switch panel by removing the six screws securing the panel in place.

— NOTE —

Note and mark wire locations before removing them from ignition switch.

(5) Remove wires K1B18 and K1C18 from screw connections on back side of starter switch.
(6) Unsolder the white and black wires from back of switch.
(7) Remove Switch.

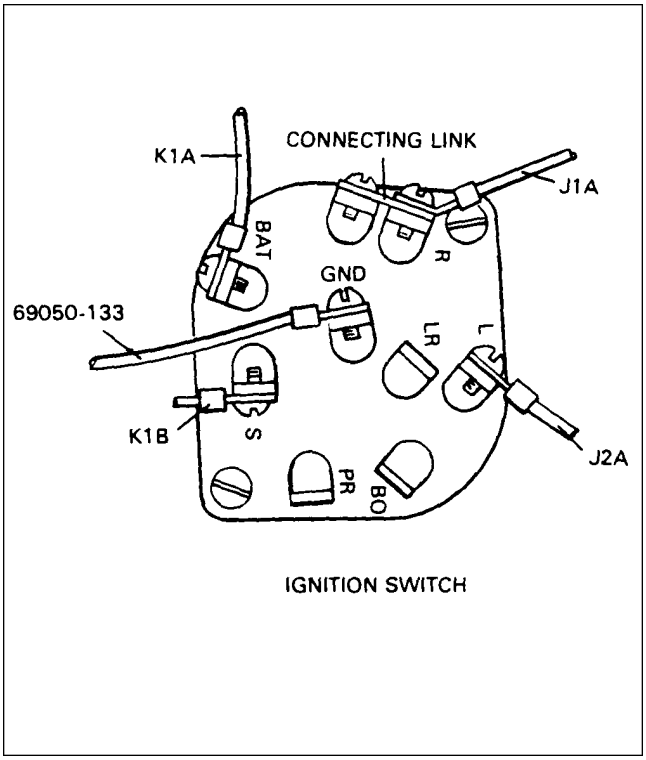


Figure 74-29. Archer II Ignition Switch Installation

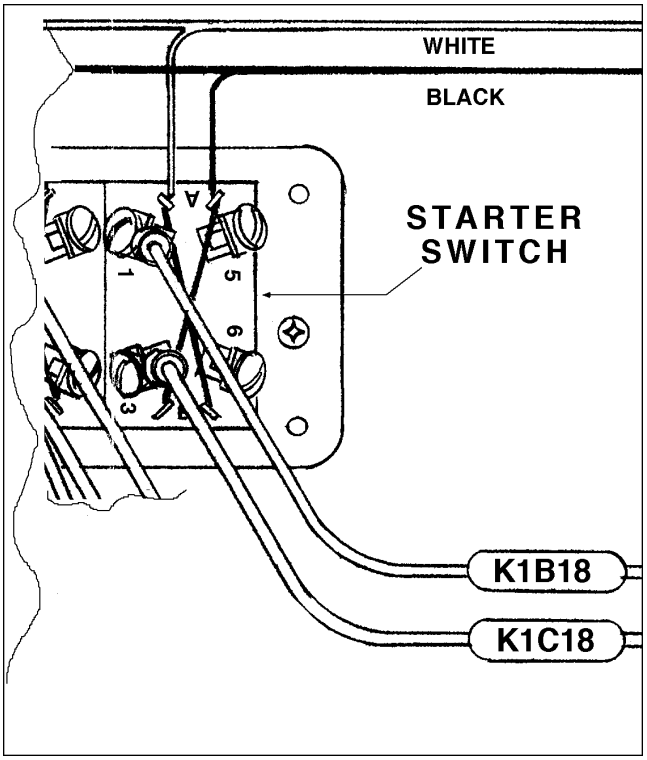


Figure 74-30. Archer III Starter Switch Installation

c. Archer III — Removal of Magneto Switch(es) (Refer to Figure 74-31)

(1) Check that ignition switch is in OFF position.
(2) Disconnect (pull) STARTER & ACC. circuit breaker.
(3) Disconnect positive cable from battery.
(4) Drop the overhead switch panel by removing the six screws securing the panel in place.

— NOTE —

Note and mark wire locations before removing them from ignition switch.

(5) To remove left magneto switch:
  (a) Remove wires J2C18 and J3B18 from screw connections on back side of switch.
  (b) Remove jumper from screw connection on back side of switch.
  (c) Unsolder the white and black wires from back of switch.
  (d) Remove Switch.
(6) To remove right magneto switch:
  (a) Remove wire J1C18 from screw connection on back side of switch.
  (b) Remove jumper from screw connection on back side of switch.
  (c) Unsolder the white and black wires from back of switch.
  (d) Remove Switch.

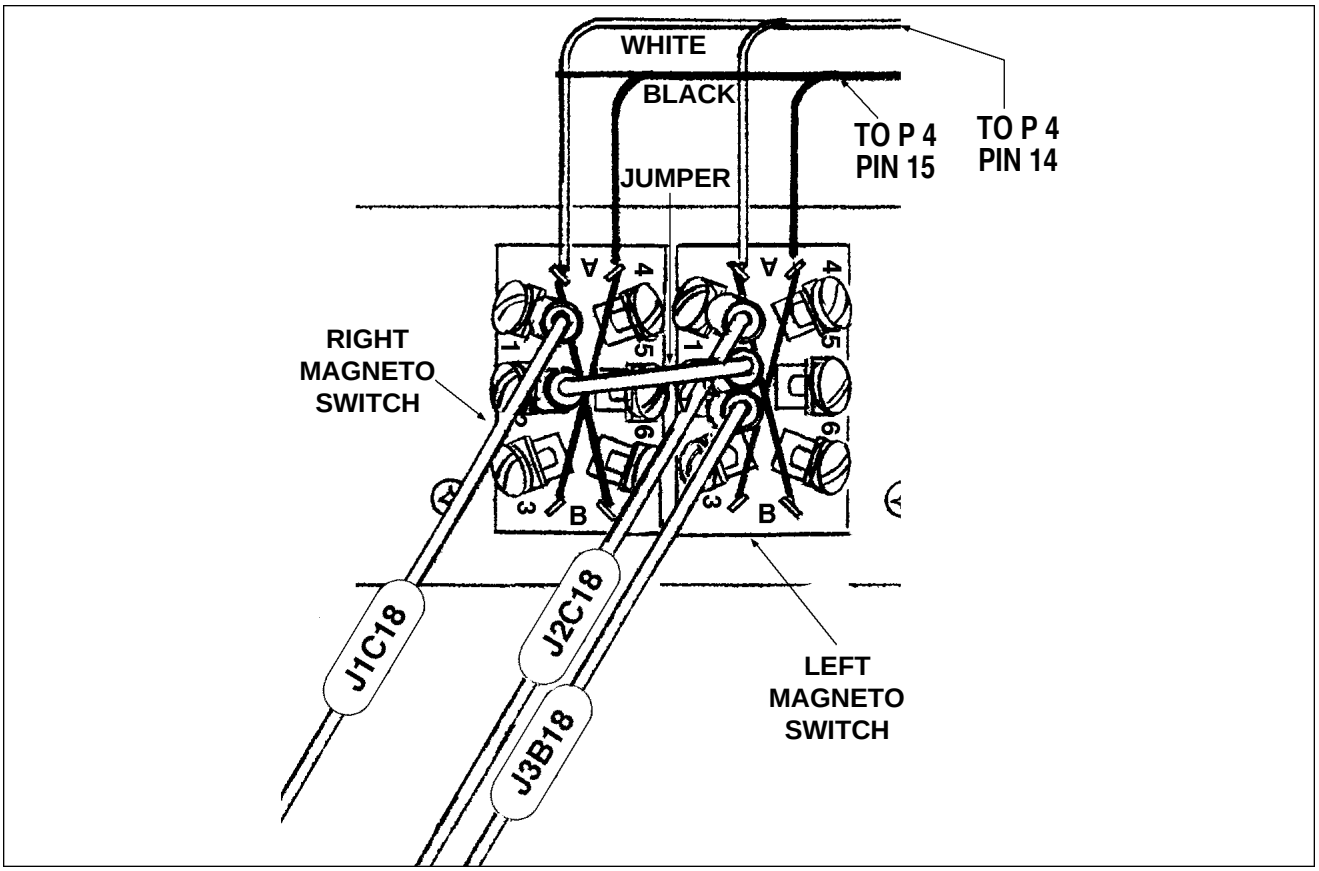


Figure 74-31. Archer III Magneto Switch(es) Installation

2. Installation of Ignition and Starter Switch

a. Archer II

(1) Connect wires to ignition switch as shown in Figure 74-29.
(2) Check for proper operation of ignition switch as follows:
  (a) Remove P lead from right magneto.
  (b) Attach P lead to ohmmeter and to airframe ground.
  (c) With switch in OFF, L or START position, ohmmeter must indicate a closed circuit.
  (d) With switch in R or BOTH position ohmmeter should indicate an open circuit.
  (e) Reconnect P lead to magneto.
(3) Position ignition switch in instrument panel and install retaining nut.
(4) Connect power lead to battery.

b. Archer III — Installation of Starter Switch

(1) Solder the white and black wires to back of starter switch as shown in Figure 74-30.
(2) Install wires K1B18 and K1C18 to screw connections on back side of starter switch as shown in Figure 74-30.
(3) Check for proper operation of starter switch as follows:
  (a) Ensure all connectors in back of switch panel are properly joined
  (b) Disconnect positive battery cable.
  (c) Attach ohmmeter to starter contactor coil at point where wire K1E18 is connected. Ground ohmmeter to airframe.
  (d) Depress starter switch. Ohmmeter must indicate a closed circuit.
  (e) Connect positive battery cable.
(4) Install starter switch in switch panel.
(5) After ensuring all connectors are properly joined, install overhead switch panel by installing the six screws securing the panel in place.
(6) Connect positive cable to battery.
(7) Engage (push in) STARTER & ACC. circuit breaker.

c. Archer III — Installation of Magneto Switch(es) (Refer to Figure 74-31)

(1) To install left magneto switch:
  (a) Solder the white and black wires to back of switch.
  (b) Connect jumper to screw connection on back side of switch.
  (c) Connect wires J2C and J3B to screw connections on back side of switch.
(6) To install right magneto switch:
  (a) Solder the white and black wires to back of switch.
  (b) Install jumper to screw connection on back side of switch.
  (c) Install wire J1C from screw connection on back side of switch.
(3) Check for proper operation of magneto switch(es) as follows:
  (a) Ensure all connectors in back of switch panel are properly joined
  (b) Remove P lead from right magneto.

(c) Attach P lead to ohmmeter and ground to airframe.
(d) With right magneto switch OFF, and left magneto switch ON, the ohmmeter must indicate a closed circuit.
(e) With start switch ON, the ohmmeter must indicate a closed circuit.
(f) With right magneto switch ON, or with both magneto switches ON, and start switch OFF, the ohmmeter should indicate an open circuit.
(g) Connect P lead to right magneto.
(h) Check that starter switch and both magneto switches are in the OFF position.

(4) Install magneto switch(es) into switch panel.
(5) After ensuring all connectors are properly joined, install overhead switch panel by installing the six screws securing the panel in place.
(6) Connect positive cable to battery.
(7) Engage (push in) STARTER & ACC. circuit breaker.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

77

ENGINE INDICATING

3G7

CHAPTER 77 - ENGINE INDICATING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
77-00-00	GENERAL	3G10	
77-10-00	POWER	3G11	
77-10-00	Tachometer Indicator	3G11	
77-20-00	Oil Temperature Indicator	3C21	
77-20-00	TEMPERATURE		
77-20-00	Exhaust Gas Temperature Gauge (Alcor)	3G13	
77-20-00	Removal of EGT Probe and Gauge	3G13	
77-20-00	Cleaning and Inspection of EGT	3G13	
77-20-00	Installation of EGT Probe and Gauge	3G13	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

—WARNING—

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

This chapter gives information on service and replacement procedures of the engine indicating system.

THIS SPACE INTENTIONALLY LEFT BLANK

POWER

A. TACHOMETER INDICATOR

The tachometer is connected to engine accessory by a flexible cable and provides reading of crankshaft speed in revolutions per minute. The instrument has a recording mechanism for recording time that engine is in operation. The time recorder will be accurate (i. e., records 1:00 hour in 60 minutes) at 75% power setting under standard sea level conditions.

CHART 7701. TROUBLESHOOTING TACHOMETER

TROUBLE	CAUSE	REMEDY
No reading on indicator, either permanent or intermittent	Broken shaft. Loose cable connections.	Replace instrument Tighten cable.
Pointer oscillates excessively.	Rough spot on, or sharp Bend in shaft. Excessive friction in instrument.	Repair or replace. Replace instrument
Indicator changes in climb	Excessive clearance in speed cup.	Replace instrument
Pointer goes all the way to stop; more noticeable in cold weather.	Excessive lubricant in instrument.	Replace instrument
Pointer jumps at idle.	Speed cup hitting rotating magnet.	Replace instrument.
Tachometer cable breaks	Cable bent too sharply.	Reroute cable.

B. MANIFOLD PRESSURE GAUGE

A manifold pressure gauge was offered as an option on the ***Archer II***. When installed, it is located on the lower instrument panel to the right of the pilot's control wheel. The gauge is a vapor proof, absolute pressure type instrument. Pressure from the intake manifold of the engine is transmitted to the gauge through a line. A pointer reads pressure in the intake manifold in inches of mercury

THIS SPACE INTENTIONALLY LEFT BLANK

Island Enterprises

CHART 7702. TROUBLESHOOTING MANIFOLD PRESSURE GAUGE

TROUBLE	CAUSE	REMEDY
Excessive error at existing barometric pressure.	Pointer shifted.	Replace instrument.
Excessive error when engine is running.	Line leaking.	Tighten line connections.
Sluggish or jerky pointer movement.	Defective instrument.	Replace instrument.
Dull or discolored markings.	Age	Replace instrument.
Incorrect reading.	Moisture or oil in line.	Disconnect lines and blow out.

THIS SPACE INTENTIONALLY LEFT BLANK

Island Enterprises

TEMPERATURE

EXHAUST GAS TEMPERATURE GAUGE (Alcor)

1. General

This instrument, known as EGT, is used to aid pilot in selecting an economical fuel-air mixture for cruising flight at a power setting of 75 percent or less, and to adjust mixture setting at altitudes above 5,000 feet. It is a sensing device to monitor fuel-air mixture leaving engine cylinders. The gauge is adjustable. If found defective after checking with troubleshooting chart, it must be replaced. If leads to gauge are defective, they must be replaced. Replace leads with same type and length of wire, as the resistance of leads is critical for proper gauge operation.

2. Removal of EGT Probe and Gauge

a. Disconnect wires from EGT gauge at instrument panel.
b. Remove four bolts holding gauge to instrument panel and remove gauge.
c. Remove wires from wire harness going to engine.
d. Loosen clamp holding EGT probe to number one cylinder exhaust manifold and remove probe.

3. Cleaning and Inspection of EGT

—CAUTION—

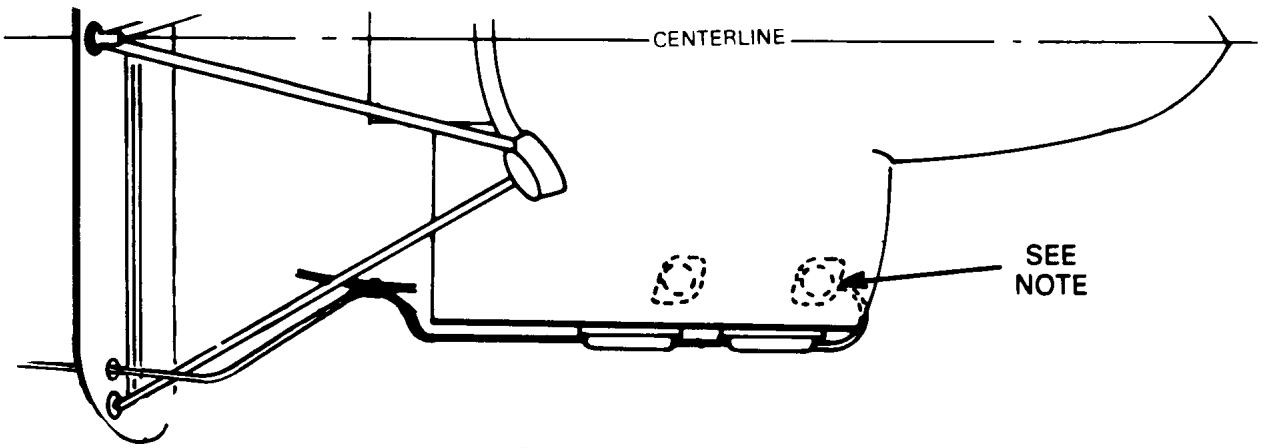
Do not connect ohmmeter across meter. It will burn out the movement of the meter.

Unless mechanical damage is evident, broken glass, bent or broken pointer, or broken case, check as follows (before removing instrument):

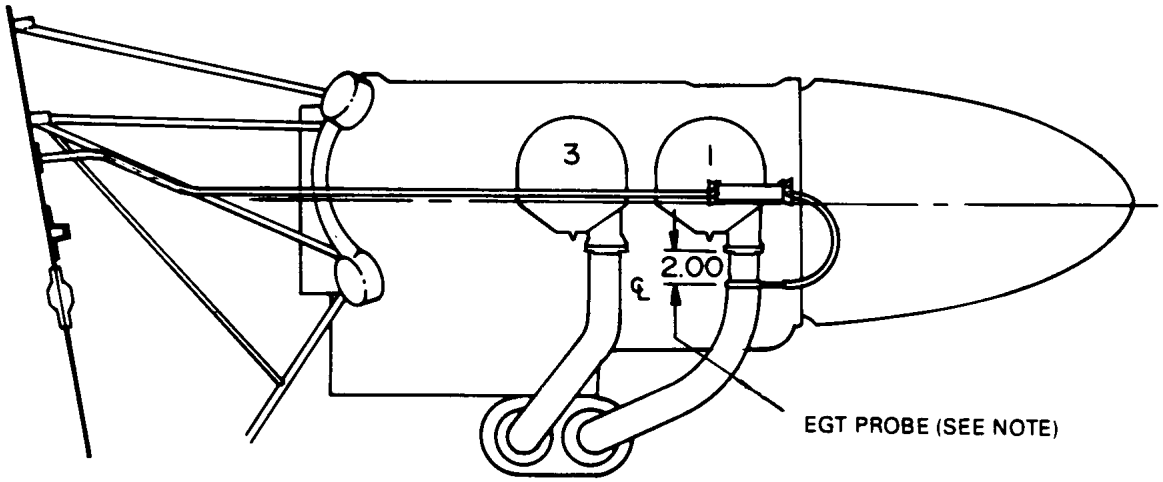
a. Remove probe from exhaust stack and check for broken weld (at tip end) or burnt off end. Measured resistance of probe must be 0.8 ohms. Clean connections with steel wool before assembly.
b. Disconnect lead wires at instrument and measure. Resistance with lead wires connected to probe must be 3.3 ohms. Clean connections with steel wool before assembly.
c. With leads connected to instrument, heat probe with propane torch to dull red. Meter must read up to fourth graduation or approximately 1500°F. Before check, make sure adjustment screw, at rear of instrument case, is in center of its travel. If screw is turned to either end of full travel, it will shut instrument off and no reading will be shown on pointer. If meter still does not read, replace it.

4. Installation of EGT Probe and Gauge (Refer to figure 77-1)

a. Install probe into hole in number one cylinder exhaust manifold and secure with clamp.
b. Route thermocouple wires with existing wire harness to instrument panel.
c. Install EGT gauge into instrument panel and secure with four bolts.
d. Connect thermocouple wires to rear of EGT gauge.



TOP VIEW



SIDE VIEW

NOTE:
0.129 INCH HOLE IN NUMBER 1 CYLINDER EXHAUST MANIFOLD IN LINE WITH CENTERLINE OF ENGINE. TIGHTEN CLAMP TO 45 INCH POUNDS TORQUE AND SAFETY WIRE.

Figure 77-1. Exhaust Gas Temperature Probe Installation

CHART 7703. TROUBLESHOOTING EXHAUST GAS TEMPERATURE GAUGE (ALCOR)

TROUBLE	CAUSE	REMEDY
Gauge inoperative.	Defective gauge, probe, or wiring.	Check probe and lead wires for chafing, breaks, or shorting between wires and metal structure.
	Adjusting potentiometer turned off scale.	Set potentiometer.
Fluctuating reading.	Loose, frayed, broken electrical leads, or faulty connections.	Clean and tighten connections. Repair or replace defective leads.

B. CYLINDER HEAD TEMPERATURE GAUGE

The cylinder head temperature gauge is available as an option on the ***Archer II***. When installed, it is included in the left side instrument cluster. The gauge utilizes a temperature sender, installed in the cylinder head of the engine, to measure head temperature. The gauge is an electrical instrument and is wired through the instruments circuit breaker.

CHART 7704. TROUBLESHOOTING CYLINDER HEAD TEMPERATURE GAUGE

TROUBLE	CAUSE	REMEDY
Instrument shows no reading.	Power supply wire broken.	Repair wire.
	Defective instrument	Replace instrument.
	Master switch OFF.	Select master switch ON.
Instrument goes all the way to the upper stop.	Wire broken between sender and gauge.	Repair wire.
	Defective sender.	Replace sender.

THIS SPACE INTENTIONALLY LEFT BLANK

Island Enterprises

CHAPTER

78

EXHAUST

3G16

CHAPTER 78 - EXHAUST

TABLE OF CONTENTS / EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
78-00-00	GENERAL	3G19	
78-00-00	Inspection of Exhaust System	3G19	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

INSPECTION OF EXHAUST SYSTEM

— NOTE —

It is recommended that all airplanes befitted with a new muffler at or before 1000 hour time-in-service since muffler installation.

The entire exhaust system, including heat exchange shroud, muffler, muffler baffles, stacks, and all exhaust connections must be rigidly inspected at each l00 hour inspection. The possibility of exhaust system failure increases with time-in-service. Check more carefully as time-in-service on the installed muffler increases. The system must be checked carefully before winter operation when cabin heat is in use. Refer to Figure 78-1 for the Archer II exhaust system. Figure 78-2 depicts the Archer III exhaust system.

Remove the tail pipe and stacks for muffler baffle inspection. Remove or loosen all exhaust shields, carburetor and cabin heat muffs, shrouds, heat blankets, etc., as required for complete system inspection. Perform cleaning operations and inspect all external surfaces for dents, cracks, and missing parts.

— CAUTION —

Apply FEL-PRO Type C5-A anti-seize lubricant to entire slip joint surface to prevent slip joint binding.

Pay particular attention to welds, clamps, supports, support attachment lugs, slip joints, stack flanges, and gaskets. Inspect internal baffles or diffusers. Any cracks, warpage, or severe oxidation are cause for muffler replacement.

If any component is inaccessible for visual inspection, do the following:

l. Do submerged pressure check of muffler and exhaust stack at 2 psi air pressure.
2. Ground test using carbon monoxide indicator by heading airplane into wind, warming engine on ground, advancing throttle to full static rpm with cabin heat valves open, and taking readings of heated airstream inside cabin at each outlet (including rear seat heat outlet, if installed). If carbon monoxide concentration exceeds 0.005 percent or if a dangerous reading is on an indicator not calibrated in percentages, muffler must be replaced.

THIS SPACE INTENTIONALLY LEFT BLANK

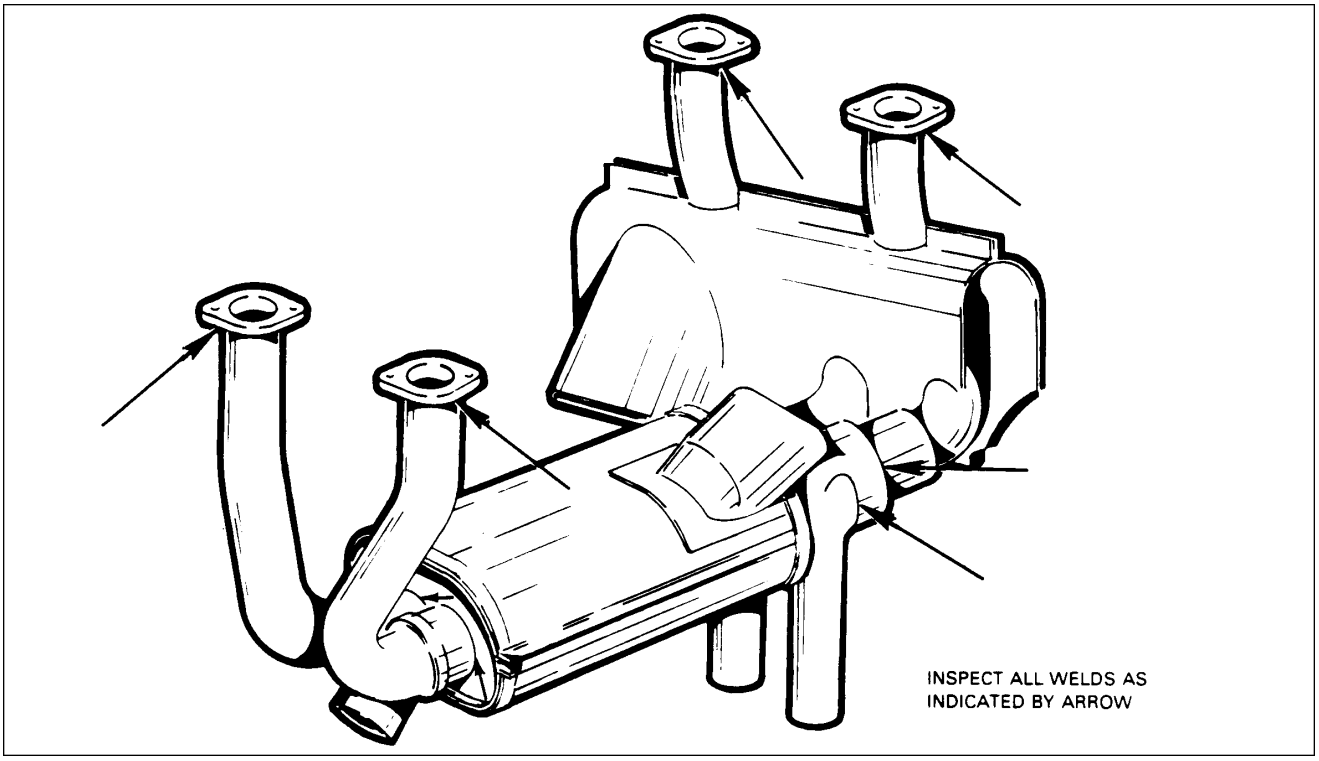


Figure 78-1. Archer II Exhaust System Inspection Points

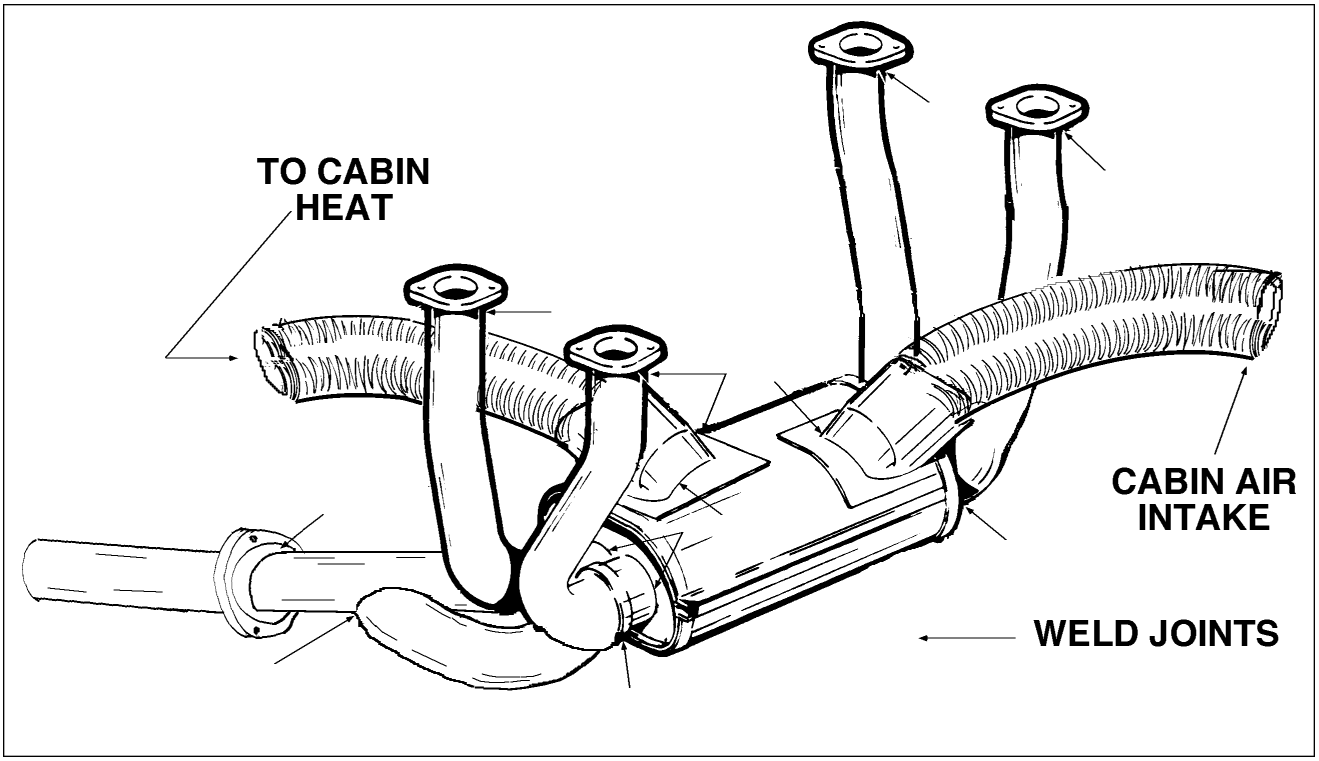


Figure 78-2. Archer III Exhaust System Inspection Points

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

79

OIL SYSTEM

3G23

CHAPTER 79 - OIL SYSTEM

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
79-20-00	DISTRIBUTION	3H2	
79-20-00	Oil Cooler	3H2	
79-20-00	Installation of Oil Cooler	3H2	
79-30-00	INDICATING	3H4	
79-30-00	Archer II	3H4	
79-30-00	Removal of Oil Pressure Sensor	3H4	
79-30-00	Removal of Oil Temperature Sensor	3H4	
79-30-00	Installation of Oil Pressure Sensor	3H4	
79-30-00	Installation of Oil Temperature Sensor	3H4	
79-30-00	Archer III	3H4	
79-30-00	Removal of Oil Pressure Sender	3H4	
79-30-00	Removal of Oil Pressure Switch	3H5	
79-30-00	Removal of Oil Temperature Sensor	3H5	
79-30-00	Installation of Oil Pressure Sender	3H5	
79-30-00	Installation of Oil Pressure Switch	3H5	
79-30-00	Installation of Oil Temperature Sensor	3H5	
79-30-00	Troubleshooting	3H5	
79-30-00	Archer II	3H5	
79-30-00	Oil Pressure Gauge	3H5	
79-30-00	Oil Temperature Gauge	3H6	
79-30-00	Archer III	3H7	
79-30-00	Oil Pressure Gauge	3H7	
79-30-00	Oil Temperature Gauge	3H7	

THIS PAGE INTENTIONALLY LEFT BLANK

DISTRIBUTION

A. OIL COOLER

B. INSTALLATION OF OIL COOLER

1. Do not apply excessive torque to oil cooler when installing cooler fittings. If rectangular fitting boss is used, use a backup wrench with a scissors motion, so no load is transmitted to cooler. When oil cooler has round fitting boss, do not use excessive torque on fittings.
2. Install pipe thread fitting only far enough to seal with sealing compound.
   a. Apply Lubon no. 404 to all male pipe thread fittings; do not allow sealant to enter system.
   b. If fitting cannot be positioned correctly using a torque of 10 to 15 foot-pounds, another fitting must be used.
3. When attaching lines to cooler, use a backup wrench.
4. After installation, inspect cooler for distorted end cups.
5. Run-up engine. After run-up, check for oil leaks.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

INDICATING

A. ARCHER II

Oil pressure is sensed by a Bourdon tube installed as an intricate part of the oil pressure instrument. The oil pressure annunciator (OIL) light is activated by an electrical sensor installed under the instrument panel.

Oil temperature is sensed by a sensor installed in the oil screen assembly on engine accessory section. Temperature is transmitted electrically to the gauge.

1. Removal of Oil Pressure Sensor

Gain access to sensor unit by reaching up under the instrument panel. To remove sensor:

a. Disconnect the two electrical leads.
b. Unscrew sensor unit from bulkhead fitting.
c. Catch spillage and cover hole to prevent foreign matter from entering oil line.

2. Removal of Oil Temperature Sensor

a. Disconnect wire from sender by removing n ut and washer securing wire to sender.
b. Remove sender.

3. Installation of Oil Pressure Sensor

a. Seal sensor unit pipe threads with thread sealant tape (3M-Teflon no. 48 x 1/4").
b. Screw sensor unit into bulkhead fitting.
c. Connect the two electrical leads.
d. Perform operational check.

4. Installation of Oil Temperature Sensor

a. Install sensor in engine accessory section.
b. Connect wire to sender.

B. ARCHER III

Oil pressure is sensed by a sender installed to the left end of a union tee located on the upper aft side of the firewall under the pilot's instrument panel. There is one electrical wire connected to it by a nut and washer.

An oil pressure switch, that controls the oil pressure (OIL PRESS) annunciator and the hour meter, is attached to the right end of the union tee . There are three wires leading from the switch to an electrical connector. When the engine is not running, the switch closes the circuit to the annunciator light and opens the circuit to the hour meter. As soon as the engine starts, and the pressure sensor senses oil pressure, it throws the oil pressure switch, which activates the hour meter and turns the OIL PRESS annunciator light OFF.

Oil temperature is sensed by a sensor installed in the accessory section of the engine immediately in front of the oil filter. Temperature is transmitted to the instrument electrically.

1. Removal of Oil Pressure Sender

a. Gain access to the sender from under the pilot's (left) instrument panel.
b. Disconnect the single wire by removing the nut and washer securing it to the sender.

— NOTE —

There will be some residual oil in the line leading to the sender and switch. Provide a means to catch any spillage that may occur when sender is removed.

c. Using a back up wrench on the union tee, remove oil pressure sender.

2. Removal of Oil Pressure Switch

a. Gain access to the switch from under the pilot's (left) instrument panel.
b. Disconnect electrical connector.

— NOTE —

There will be some residual oil in the line leading to the sender and switch. Provide a means to catch any spillage that may occur when switch is removed.

c. Using a back up wrench on the union tee, remove oil pressure switch.

3. Removal of Oil Temperature Sensor

a. Remove safety wire securing cannon plug connector to sensor.
b. Remove cannon plug connector.
c. Remove sensor.

4. Installation of Oil Pressure Sender

a. Wrap sender threads with teflon sealant tape (3M-Teflon no 48 x 1/4").
b. Install sender to union tee and finger tighten.
c. Using a back up wrench on union tee, ***snug*** sender to tee.
d. Connect instrument wire to switch.
e. Perform operational check.

5. Installation of Oil Pressure Switch

a. Wrap switch threads with teflon sealant tape (3M-Teflon no 48 x 1/4").
b. Install switch to union tee and finger tighten..
c. Using a back up wrench on union tee, ***snug*** switch to tee.
d. Join electrical connector.
e. Perform operational check.

6. Installation of Oil Temperature Sensor

a. Install oil temperature sensor into engine.
b. Install cannon plug connector and safety.
c. Perform operational check.

C. TROUBLESHOOTING

1. Archer II

a. Oil Pressure Gauge

The oil pressure gauge is mounted in the cluster on the instrument panel. The gauge reads the amount of oil pressure available at the pressurized oil passage.

CHART 7901. TROUBLESHOOTING ARCHER II ENGINE OIL PRESSURE GAUGE

TROUBLE	CAUSE	REMEDY
Excessive error at zero.	Pointer loose on shaft. Over pressure or seasoning of Bourdon tube.	Replace instrument. Replace instrument.
Excessive scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation.	Air in line or rough engine relief.	Disconnect line and fill with light oil. Check for leaks. If trouble persists, clean and adjust relief valve.
Sluggish operation of pointer or pressure fails to build up.	Engine relief valve open. Loss of oil pressure.	Clean and check valve. ***Immediately*** shut down (stop) engine.

b. Oil Temperature Gauge.

The oil temperature gauge is mounted in the instrument cluster on the instrument panel. The gauge provides temperature reading of the engine oil in degrees fahrenheit.

CHART 7902. TROUBLESHOOTING ARCHER II ENGINE OIL TEMPERATURE GAUGE

TROUBLE	CAUSE	REMEDY
Instrument fails to read.	Broken or damaged sensor. Open wire.	Check engine unit. Check wiring to instrument.
Excessive scale error.	Improper calibration adjustment	Replace instrument.
Pointer fails to move as engine is warmed up.	Broken or damaged sensor. Open wire(s).	Check engine unit. Check wiring to instrument.
Dull or discolored markings.	Age.	Replace instrument.

2. Archer III

a. Oil Pressure Gauge

The oil pressure gauge is mounted in the cluster on the instrument panel, and reads the amount of oil pressure available at the pressurized oil passage. The cluster consists of the fuel pressure gauge and the oil temperature gauge, along with the oil pressure gauge, mounted in a common circular instrument head. Since the instruments are inseparable, if any one becomes defective, necessitating replacement, it will require replacing the complete cluster.

CHART 7903. TROUBLESHOOTING ARCHER III ENGINE OIL PRESSURE GAUGE

TROUBLE	CAUSE	REMEDY
Excessive error at zero.	Pointer loose on shaft.	Replace instrument.
Excessive scale error.	Improper calibration adjustment.	Replace instrument.
Excessive pointer oscillation.	Air in line or rough engine relief.	Disconnect line and fill wit light oil. Check for leaks. If trouble persists, clean and adjust relief valve.
	Bad oil pressure sender.	Replace sender.
	Bad instrument.	Replace instrument
Sluggish operation of pointer or pressure fails to build up.	Loss of oil pressure.	***Immediately*** shut down (stop) engine.
	Engine relief valve open.	Clean and check valve.
	Bad oil pressure sender.	Replace sender.

b. Oil Temperature Gauge

The oil temperature gauge is mounted in the cluster on the instrument panel, and reads the oil temperature in degrees fahrenheit. The cluster consists of the fuel pressure gauge and the oil pressure gauge, along with the oil temperature gauge, mounted in a common circular instrument head. Since the instruments are inseparable, if any one becomes defective, necessitating replacement, it will require replacing the complete cluster.

CHART 7904. TROUBLESHOOTING ARCHER III ENGINE OIL TEMPERATURE GAUGE

TROUBLE	CAUSE	REMEDY
Instrument fails to read.	Broken or damaged sensor. Open wire.	Check engine unit. Check wiring to instrument.
Excessive scale error.	Improper calibration adjustment	Replace instrument.
Pointer fails to move as engine is warmed up.	Broken or damaged sensor. Open wire(s).	Check engine unit. Check wiring to instrument.
Dull or discolored markings.	Age.	Replace instrument.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CHAPTER

80

STARTING

3H10

CHAPTER 80 - STARTING

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
80-00-00	GENERAL	3H13	
80-00-00	Description and Operation	3H13	
80-00-00	Troubleshooting	3H14	
80-10-00	CRANKING	3H18	
80-10-00	Maintenance of Starting System	3H18	
80-10-00	Overhaul of Starting Motor	3H18	
80-10-00	Removal of Starting Motor	3H19	
80-10-00	Disassembly of Starting Motor	3H19	
80-10-00	Brushes	3H20	
80-10-00	Armature	3H20	
80-10-00	Field Coils	3H20	
80-10-00	Brush Holders	3H21	
80-10-00	Gear and Pinion Housing	3H21	
80-10-00	Bendix Drive	3H21	
80-10-00	Assembly of Starting Motor	3H21	
80-10-00	Bench Test	3H21	
80-10-00	Starting Motor Control Circuit	3H22	
80-10-00	Starting Motor Service Test Specifications	3H23	
80-10-00	Starting Through External Power Receptacle With Airplane's Battery Nearly Depleted	3H23	

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL

— WARNING —

It is the user's responsibility to refer to the applicable vendor publication when servicing or inspecting vendor equipment installed in Piper aircraft, .

This chapter gives information on service and replacement procedures of the starting system.

A. DESCRIPTION AND OPERATION (Refer to figure 80-l.)

The Archer II is equipped with a 12 Vdc starter; the Archer III has a 24 Vdc starter. The following description and procedures apply to both the 12 Vdc and 24 Vdc starters.

The gear reduction starting motor has six major components: the commutator end head assembly, the armature, the frame and field assembly, the gear housing, the pinion housing, and the Bendix drive assembly. When the starting circuit is energized, battery current (12 or 24 Vdc, as applicable) is applied to the starting motor terminal. Current flows through the field coils, creating a strong magnetic field. At the same time, current flows through the brushes to the commutator, through the armature windings to ground. The magnetic force created in the armature, combined with that created in the field windings, begins to turn the armature.

The gear cut on the drive end of the armature shaft extends through the gear housing, and is supported by a roller bearing. The gear mates with the teeth of the reduction gear that drives the Bendix shaft. The shaft is keyed to the reduction gear. The Bendix drive is held in position on the shaft by a spiral pin. The shaft is supported in the gear housing by a closed end roller bearing and in the pinion housing by a graphitized bronze bearing.

When the armature turns the reduction gear, the Bendix drive pinion engages with the flywheel ring gear by inertia and action of the screw threads within the Bendix sleeve. A detent pin fits in a notch in the screw threads and prevents disengaging if engine fails to start when the starting circuit is de-energized.

When the engine reaches a predetermined speed, centrifugal action forces the detent pin out of the notch in the screw shaft and allows the pinion to disengage from the flywheel.

THIS SPACE INTENTIONALLY LEFT BLANK

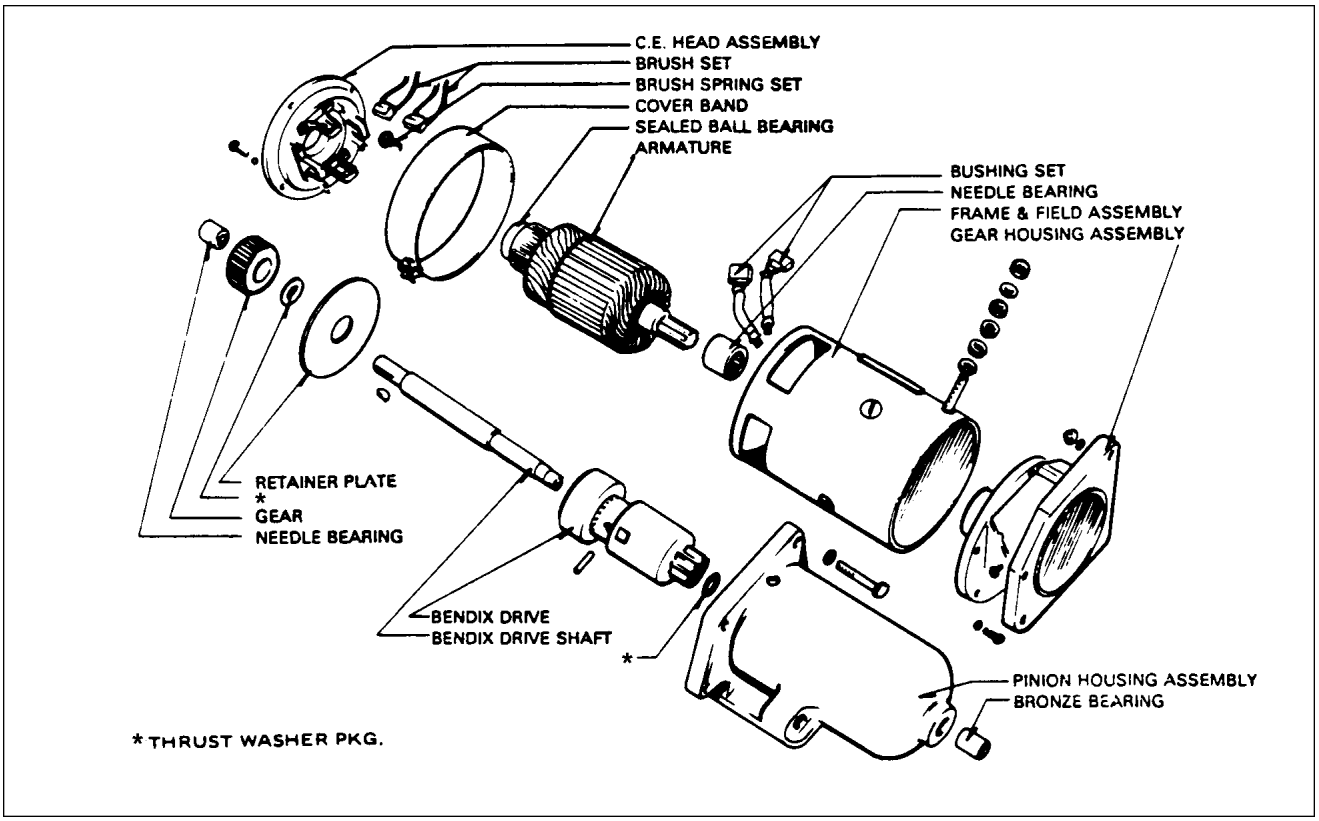


Figure 80-1. Exploded view if Gear Reduction Starting Motor

B. TROUBLESHOTING

CHART 8001. TROUBLESHOOTING STARTER (1 OF 3)

TROUBLE	CAUSE	REMEDY
Motor fails to operate.	Low battery charge.	Check and recharge if necessary.
	Defective or improper wiring or loose connections.	Refer to electrical wiring diagram and check all wiring.
	Defective starter solenoid or control switch.	Replace faulty unit.

CHART 8001. TROUBLESHOOTING STARTER (2 OF 3)

TROUBLE	CAUSE	REMEDY
Motor fails to operate. (contd)	Binding, worn, or improperly seated brush, or brushes with excessive side play.	Brushes must be a free fit in the brush boxes without excessive side play. Binding brushes and brush boxes must be wiped clean with a gasoline (undoped) moistened cloth. A new brush must be run in until at least 50 percent seated; however, if facilities are not available for running in brushes, then the brush must be properly seated by inserting a strip of number 000 sandpaper between brush and commutator, with sanded side next to brush. Pull sandpaper in direction of rotation, use care to keep it same contour as commutator. ***— CAUTION —*** ***Do not use coarse sandpaper or emery cloth. After seating, clean thoroughly to remove all sand and metal particles to prevent excessive wear. Keep motor bearing free from sand or metal particles.***
	Dirty commutator.	If commutator is rough or dirty, smooth and polish with number 0000 sandpaper. lf too rough and pitted, remove and turn down. Blow out all particles.
	Shorted, grounded, or open armature.	Remove and replace with armature known to be of good condition.
	Grounded or open field circuit.	Test, repair if possible, or replace with new part.

CHART 8001. TROUBLESHOOTING STARTER (3 OF 3)

TROUBLE	CAUSE	REMEDY
Low motor and cranking speed.	Worn, rough, or improperly lubricated motor or starter gearing.	Disassemble, clean, inspect, and lubricate. Replace ball bearings if worn.
	Same electrical causes as ***Motor Fails to Operate***.	Same remedies listed for these troubles.
Excessive arcing of motor brushes.	Binding, worn, or improperly seated brush or brushes with excessive side play.	See above information.
	Dirty, rough, pitted, or scored commutator.	Clean as outlined above.
Excessive wear ***and*** arcing of motor brushes.	Rough or scored commutator.	Remove and turn commutator down on a lathe.
	Armature assembly not concentric.	Reface commutator.

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

CRANKING

A. MAINTENANCE OF STARTING SYSTEM

The starting system installation requires inspection each 50 hour inspection interval or every 30 days whichever occurs first.

l. The battery must be checked with a hydrometer to be sure it is fully charged and filled to proper level with approved water. A load test must be made to determine battery condition. If dirt and corrosion have accumulated on the battery, clean with a solution of baking soda and water. Be sure no solution enters the battery cells.

2. The starting circuit wiring must be inspected to be sure that all connections are clean, tight, and the insulation is sound. A voltage loss test must be made to find any high resistance connections that affect starting motor efficiency. The test is made with a low-reading voltmeter while cranking engine or at approximately l00 amperes. The following limits must be used:
   a. Voltage loss from insulated battery post to starting motor terminal - 0.3 volt maximum.
   b. Voltage loss from battery ground post to starter frame - 0. l volt maximum.

— NOTE —

If voltage loss is greater than above limits, additional tests must be made over each part of circuit to locate high resistance connections.

3. No lubrication is required on starting motor except at overhaul. Then lubricate entire shaft under Bendix drive, fill grooves in armature shaft at drive end, and pack gear box with l.3 to 2.0 ounces of lithium soap base grease Texaco #1925 Molytex O or equivalent. Thoroughly clean and pack needle bearings with Shell Alvania #2 or equivalent bearing lubricant.

4. Starting motor must be operated a few seconds with ignition switch off to make sure pinion engages properly and turns freely without binding or excessive noise. Engine must be started two or three times to see that pinion disengages properly when engine is off.

—CAUTION—

Do not use aluminum cable to repair wiring. If there is a fault in the aluminum cable, complete cable assembly must be replaced with copper wire and suitable terminals. Aluminum cable wiring was used in: battery circuit, battery to ground, battery to master relay, master relay to starter solenoid, starter solenoid to starter, and engine return ground wire to airframe (see individual schematics).

5. Check aluminum cables in battery circuit for unsatisfactory conditions such as loose or corroded terminals.

B. OVERHAUL OF STARTING MOTOR

If any indication of starting motor difficulty is noted, starting motor must be removed from engine for cleaning and repair.

C. REMOVAL OF STARTING MOTOR

1. Disconnect ground cable from battery post to prevent a short circuit.
2. Disconnect lead from starting motor terminal.
3. Remove mounting bolts.
4. Remove motor.

D. DISASSEMBLY OF STARTING MOTOR

1. Remove frame screws from commutator end head and pull end head and armature from frame. Lift brushes and lock in elevated position with brush springs. Use a puller to remove end head from armature. Use a special bearing puller to remove sealed ball bearing from armature shaft.
2. Remove frame screws holding gear housing to frame. Remove bolts and nuts holding gear housing to pinion housing and separate two units. Pull Bendix shaft from pinion housing. Do not use steel spacer on pinion end of shaft. Remove reduction gear, woodruff key and steel spacer from shaft.
3. Turn Bendix pinion until it locks in extended position. Locate spiral pin and use a punch to remove. Slide drive assembly off shaft. Do not disassemble drive and do not dip it in cleaning solvent.
4. Remove roller bearings from gear housing, with arbor press and correct bearing arbor. Do not hammer out. Parts must be cleaned and inspected for excessive wear or damage. Bearings must be checked for proper clearance, evidence of roughness, or galling. Oil and dirt must be removed from insulation.
5. Check insulation condition.

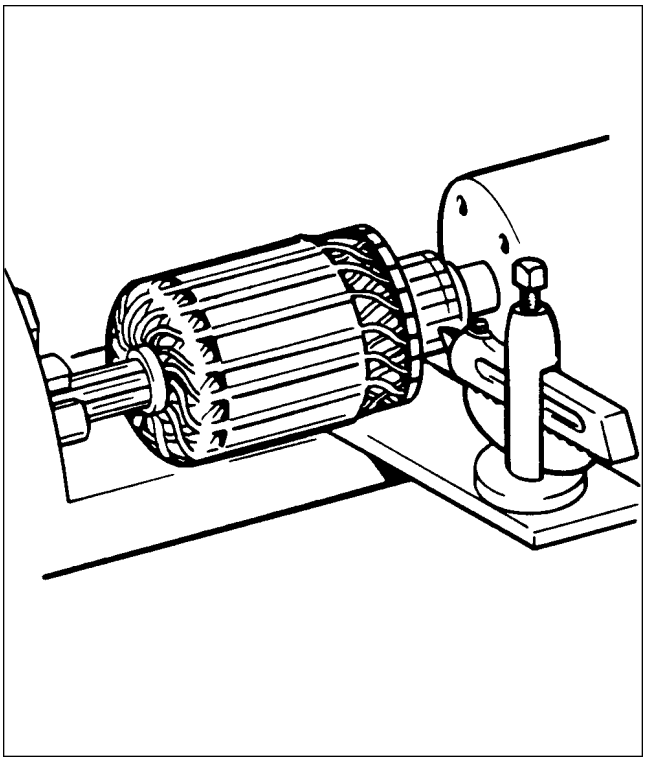


Figure 80-2. Turning Starting Motor Commutator

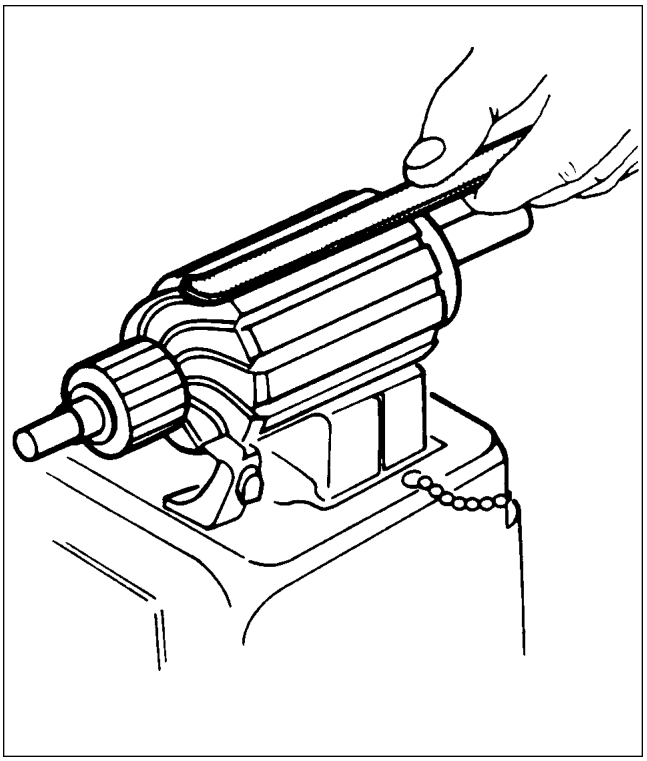


Figure 80-3. Testing Motor Armature for Shorts

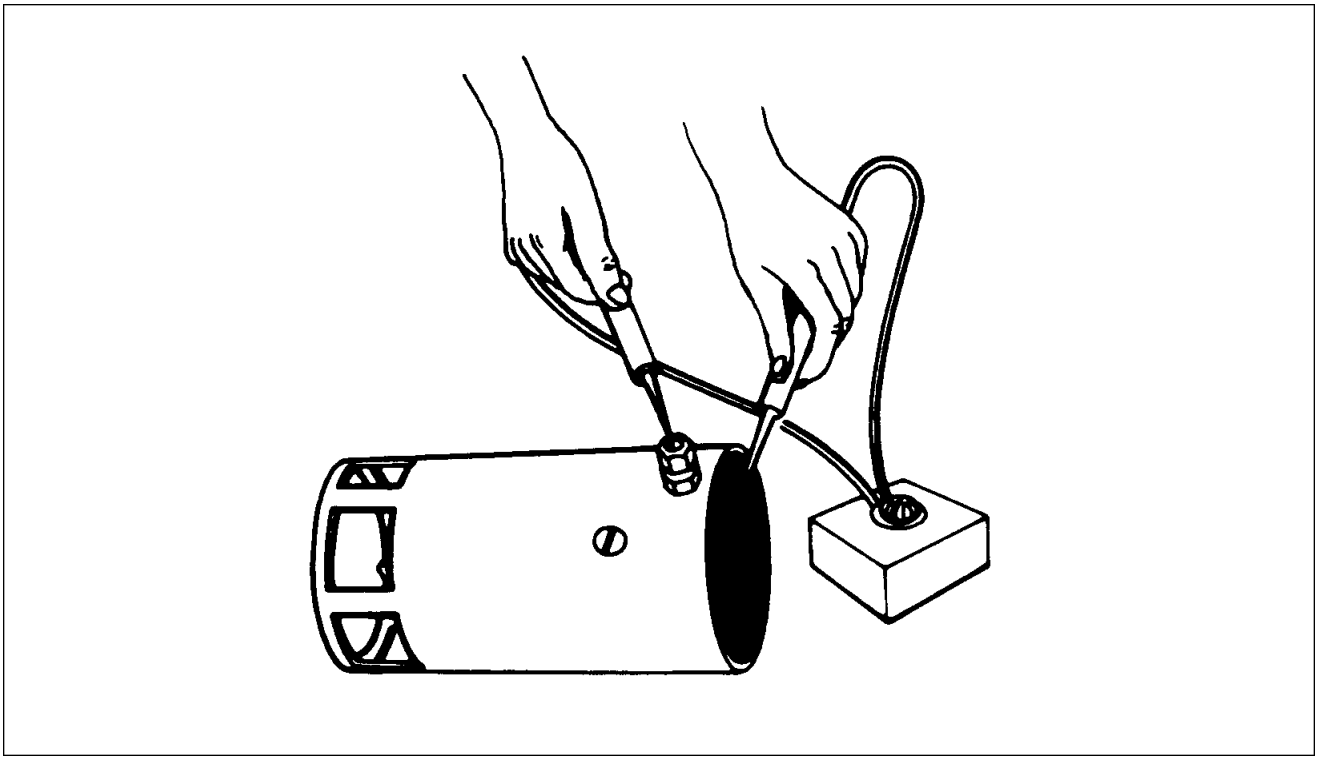


Figure 80-4. Testing Motor Field for Grounds

E BRUSHES

Check brushes slide freely in their holders and make full contact on commutator. If worn one quarter inch or less, they must be replaced.

F. ARMATURE

l. Check commutator for uneven wear, excessive glazing, or evidence of excessive arcing. If slightly dirty, glazed or discolored, commutator can be cleaned with 00 or 000 sandpaper. lf commutator is rough or worn, turn in a lathe. (Refer to Figure 80-2.) Armature shaft must be inspected for rough bearing surfaces and rough or damaged splines.
2. Test armature for grounds, with a set of test probes connected in series with a 110-volt light. Touch one probe to commutator segment and the other to armature core. lf test lamp lights, armature is grounded and must be replaced.
3. To test for shorted armature coils, use a growler. (Refer to figure 80-3.) Armature is placed on growler and slowly rotated by hand while a steel strip is held over the core so that it passes over each armature core slot. If a coil is shorted, steel strip will vibrate.
4. Make quick check for opens by inspecting trailing edge (in direction of rotation) of commutator segments for excessive discoloration. This condition indicates an open circuit.

G. FIELD COILS

l. Check field coils for grounds (refer to figure 80-4) by placing one test probe on frame and other on starter terminal. Be sure brushes are not accidentally touching frame. If lamp lights, fields are grounded. Repair or replace.
2. Inspect all connections, make sure they are clean and tight, and inspect insulation for deterioration.

H. BRUSH HOLDERS

l. To test brush holders, touch one test probe to brush plate and the other to each brush holder.
2. Test lamp must light when grounded brush holders are touched and must not light when insulated brush holders are touched.

I. GEAR AND PINION HOUSING

Inspect housings for cracks, and bearings for excessive wear. Remove rust, paint, or grease from mounting surfaces.

J. BENDIX DRIVE

The Bendix Drive must be wiped clean with a dry cloth. Pinion must turn smoothly in one direction and lock in the other direction. Replace drive if it fails to check as above, or if pinion teeth are excessively worn, or damaged.

K. ASSEMBLY OF STARTING MOTOR

l. When assembling starting motor, use an arbor press and proper bearing arbor for installing graphitized bronze and roller bearings.
2. New brushes must be properly seated when installing by wrapping a strip of 00 sandpaper around commutator (sanding side out) l-l/4 to l-l/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in direction of rotation. Dust must be blown out of motor after sanding.

— NOTE —

Spring tension is 32 to 40 ounces with new brushes. Tension is measured with scale hooked under brush spring at brush. Pull on a line opposite the line of force exerted by spring and take reading just as spring leaves brush.

3 Check position of pinion to be sure unit will mesh properly with flywheel ring gear.

L. BENCH TEST

1. After starting motor is assembled test to see that the no-load current at a certain voltage is per specifications in starting motor service test specifications. To test, connect as shown in figure 80-5. lf current is too high, check bearing alignment and end play to make sure there is no binding or interference. Two or three sharp raps on frame with a rawhide hammer will often help to align bearings and free armature.
2. If no difficulty is indicated in the above test, conduct a torque test to see if starting motor is producing its rated cranking power. Make test connections as shown in figure 80-6.
3. If torque and current are not within specifications, check seating of brushes and internal connections for high resistance. If found to be in good order, replace frame and field assembly and test starter.

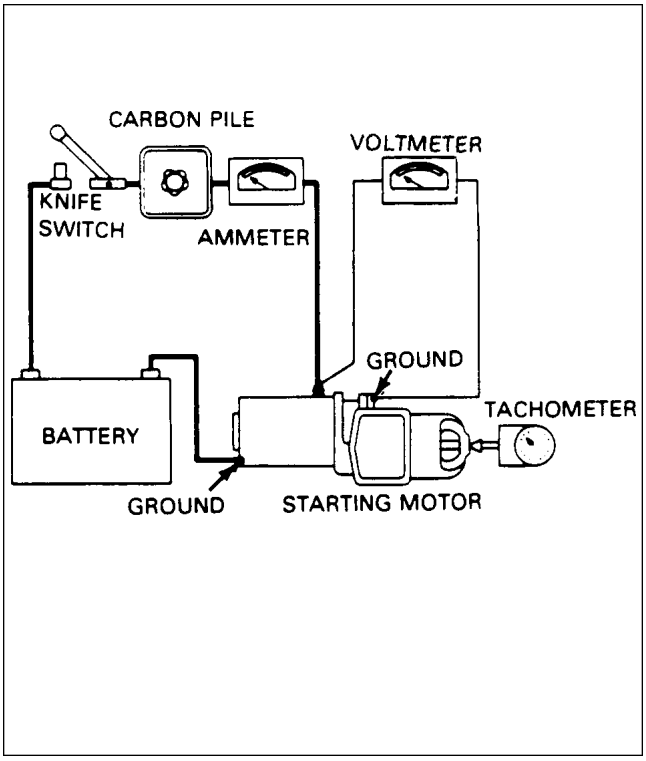


Figure 80-5. No-Load Test Hookup

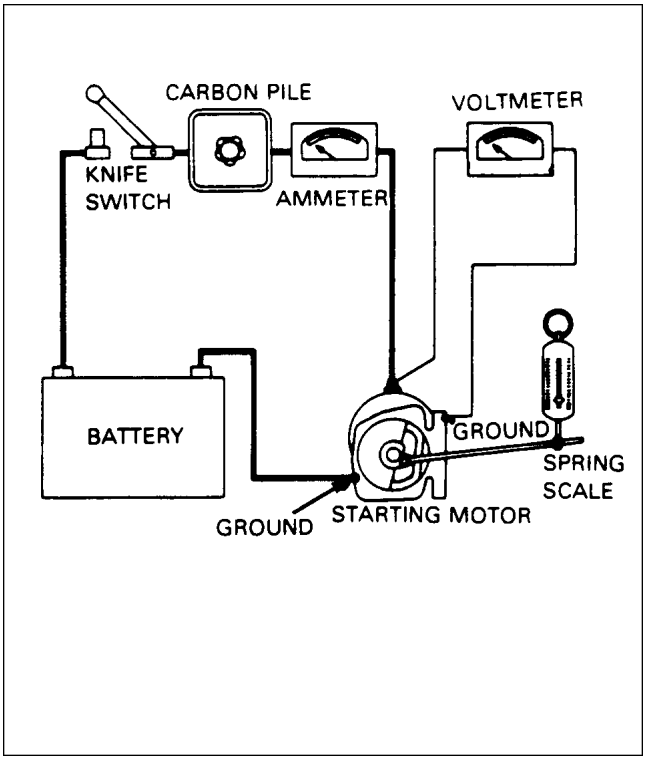


Figure 80-6. Stall-Torque Hookup

M. STARTING MOTOR CONTROL CIRCUIT

1. Inspect control circuit between battery, solenoid, and manual starting switches for breaks, poor connections and faulty insulation. Tighten all connections and make sure solenoid is firmly mounted and makes good ground connection.
2. Check voltage loss across switch contacts during normal starting. lf loss is in excess of 0.2 volts per 100 amperes, solenoid must be replaced.
3. If solenoid fails to operate when manual starting switch is turned on or if it fails to release when manual starting switch is released, it must be removed and tested to specifications. lf either opening or closing voltages are not to specifications, replace solenoid.

THIS SPACE INTENTIONALLY LEFT BLANK

N. STARTING MOTOR SERVICE TEST SPECIFICATIONS

Prestolite specifications for 12 or 24 volt starting motors installed as standard equipment on PA-28-181 series aircraft are as follows:

CHART 8002. STARTING MOTOR SPECIFICATIONS

Motor Model	MZ-4206	MHB-4016 (Lyc # LW15572)
Min Brush Tension Max Brush Tension	32 oz 40 oz	32 oz 40 oz
No-Load Test (75° F:) Volt Max Amps Min rpm	 10 75 l600	 20 35 1300
Stall Torque Amps Min Torque, ft lbs Approx Volts	 560 37.5 4.0	 260 Maximum 27 14

O. STARTING THROUGH EXTERNAL POWER RECEPTACLE WITH AIRPLANE'S BATTERY NEARLY DEPLETED.

1. Archer II - 12 Volt D. C. System

Use the following procedure for starting with a 12 volt battery for external power when the airplane's battery is nearly depleted:

a. Position master switch OFF.
b. Position all electrical eqipment OFF.
c. Connect ***red*** lead of external power cable to the ***positive*** post of an external 12 Vdc battery.
d. Connect ***black*** lead of external power cable to the ***negative*** post of an external 12 Vdc battery.
e. Connect external battery power cable plug into fuselage external power receptacle.
f. Position master switch ON.
g. Start engine using normal starting procedure.
h. Reduce power to lowest possible rpm.
i. Disconnect external battery power cable from fuselage external power receptacle.
j. Check master switch is ON and check ammeter.

2. Archer III - 24 Volt D. C. System

Use the following procedure for starting with a 24 volt external power supply when the airplane's battery is nearly depleted:

— CAUTION —

Care should be exercised when ships battery is depleted. If the battery switch is positioned ON, the external power supply can be reduced to the level of the airplane's battery.

a. Position battery master switch OFF.
b. Position alternator switch OFF.
c. Position magneto switches OFF.
d. Check that all electrical switches are positioned OFF.
c. Connect ***red*** lead of external power cable to the ***positive*** post of an external 24 Vdc battery.
d. Connect ***black*** lead of external power cable to the ***negative*** post of an external 24 Vdc battery.
e. Connect external battery power cable plug into fuselage external power receptacle.
f. Start engine using normal starting procedure.
g. After engine starts:
   (1) Reduce power to lowest possible rpm.
   (2) Disconnect external battery power cable from fuselage external power receptacle.
   (3) Position battery master ans alternator switches ON. Check ammeter for electrical output.

THIS SPACE INTENTIONALLY LEFT BLANK

GRIDS 3I1 THROUGH 3I3
INTENTIONALLY LEFT BLANK

CHAPTER

91

CHARTS AND WIRING DIAGRAMS

3I4

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	EFFECTIVITY
91-l0- 00	TORQUE REQUIREMENTS	3E4	
91-10-00	Flare Fitting Torques	3E4	
91-l0-00	Recommended Nut Torques	3E5	
91-10-00	DECIMAL CONVERSIONS	3E8	
91-10-00	CONVERSION TABLES	3E9	
91-10-00	LIST OF SPECIAL TOOLS	3El5	
91-10-00	LIST OF CONSUMABLE MATERIALS	3El6	
91-10-00	ELECTRICAL WIRE CODING	3F l	
91-10-00	ELECTRICAL SYMBOLS	3F2	

REFER TO CARD 4
FOR WIRING DIAGRAMS

THIS PAGE INTENTIONALLY LEFT BLANK

TORQUE REQUIREMENTS

Torque values given in chart 9l02 are derived from oil-free cadmium-platcd threads and are recommended for all airframe installation procedures where torquing is rcquired (unless otherwise noted in sections where other values are stipulated). Engine torque values are found in latest revision of Lycoming overhaul manual. Propeller torque values are in chapter 6l of this manual. Chart 9l0l lists torque values for flared fittings of various sizes and maternal.

— CAUTION —

Do not over torque fittings.

— NOTE —

When flared fittings are being installed, make sure male threads are properly lubricated. Torque fittings per chart 9101.

CHART 9101. FLARE FITTING TORQUES

TORQUE—INCH-POUND						
TUBlNG OD lNCHES	ALUMlNUM - ALLOY TUBlNG FLARE - AND 10061 OR AND 10078		STEEL TUBlNG FLARE AND 10061		HOSE END FITTIING AND HOSE ASSEMBLIES	
	MINlMUM	MAXlMUM	MINIMUM	MAXlMUM	MlNIMUM	MAXIMUM
1/8	— — —	— — —	— — —	— — —	— — —	— — —
3/16	— — —	— — —	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	700	1150
1-1/ 4	600	900	— — —	— — —	— — —	— — —
1-1/2	600	900	— — —	— — —	— — —	— — —
1-3/4	— — —	— — —	— — —	— — —	— — —	— — —
2	— — —	— — —	— — —	— — —	— — —	— — —

CHART 9102. RECOMMENDED NUT TORQUES (Sheet 1 of 2)

TORQUES: The importance of correct application can not be overemphasized. Undertorque can result in unnecessary wear of nuts and bolts as well as the parts they are holding together. When insufficient pressures are applied, uneven loads will be transmitted throughout the assembly which may result in excessive wear or premature failure due to fatigue. Overtorque can be equally damaging because of failure of a bolt or nut from overstressing the threaded areas. The following procedures should be followed to assure that the correct torque is applied:

1. Self-Locking Fasteners - Add the friction torque from Chart "A" for sizes 8 through 7/16 to the recommended torque from Chart "B" to get the final torque. This would be the actual reading on the torque wrench. To determine friction drag torque for sizes 1/2 through 1 1/4, turn the nut fully on to the bolt and determine the torque required to turn the nut. Add this friction drag torque to the torque given in Chart "B".
2. Castellated and Non-Self Locking Nuts - Use only the torque given in Chart "B". Unless otherwise specified, when castellated nuts are used with a cotter pin on moving joints, do not torque the nut. Turn the nut onto the bolt until proper grip is established and alignment with the cotter pin hole is achieved. Then install the cotter pin.

GENERAL REQUIREMENTS.

1. Calibrate the torque wrench periodically to assure accuracy. Recheck frequently.
2. Ascertain that the bolt and nut threads are clean and dry (unless otherwise specified by the manufacturers.) If the bolt or nut is required to be lubricated prior to tightening, the torque range should be reduced 50 percent.
3. Use a bolt long enough to prevent bearing loads on the threads. The complete chamfer or end radius of the bolt or screw must extend through the nut.
4. Unique torques specified in the text of this manual supercede the torques given in Charts "A" and "B".
5. Refer o the latest revision of Lycoming Service Table Limits, SSP1776, for torques on parts used on Lycoming engines.
6. A maximum of two AN960 washers may be added under bolt heads or nuts to correct for variations in material thickness within the tolerances permitted.
7. Self-Locking Fasteners - Limitations of the use of self-locking nuts, bolts and screws including fasteners with non-metallic inserts are as follows:
   a. Fasteners incorporating self-locking devices shall not be reused if they can be run-up using only fingers. They may be reused if hand tools are required to required to run them up providing there is no obvious damage to the self-locking device prior to installation.
   b. Bolts 5/16 inch diameter and over with cotter pin holes may be used with self-locking nuts. Nuts with non-metallic locking devices may be used in this application only if the bolts are free from burrs around the cotter pin hole.
   c. Do not use self-locking nuts at joints which subject either the nut or bolt to rotate.
   d. Never tap or rethread self-locking fasteners. Do not use nuts, bolts or screws with damaged threads or rough ends.

CHART A

BOLT SIZE	FRICTION DRAG TORQUE (IN. -LB.)
8 (course thread)	15
10	18
1/4	30
5/16	60
3/8	80
7/16	100

CHART B

COARSE THREAD SERIES

BOLTS
Steel Tension

AN 3 THROUGH AN 20
AN 42 THROUGH AN 49
AN 73 THROUGH AN 81
AN 173 THROUGH AN 186
MS 20033 THROUGH MS 20046
MS 20073
MS 20074
AN 509 NK9
MS 24694
AN 525 NK525
MS 27039

NUTS

Steel Tension	Steel Shear
AN 310	AN 320
AN 315	AN 364
AN 363	NAS 1022
AN 365	MS 17826
NAS 1021	MS 20364
MS 17825	
MS 21045	
MS 20365	
MS 20500	
NAS 679	

Nut-bolt size	Torque Limits in-lbs.		Torque Limits in-lbs.	
	Min.	Max.	Min.	Max.
8-32	12	15	7	9
10-24	20	25	12	15
1/4-20	40	50	25	30
5/16-18	80	90	48	55
3/8-16	160	185	95	110
7/16-14	235	255	140	155
1/2-13	400	480	240	290
9/16-12	500	700	300	420
5/8-11	700	900	420	540
3/4-10	1,150	1,600	700	950
7/8-9	2,200	3,000	1,300	1,800
1-8	3,700	5,000	2,200	3,000
1-1/8-8	5,500	6,500	3,300	4,000
1-1/4-8	6,500	8,000	4,000	5,000

CHART 9102 RECOMMENDED NUT TORQUES (Sheet 2 of 2)

FINE THREAD SERIES

	BOLTS Steel Tension		**BOLTS Steel Tension**		**BOLTS Aluminum**	
	AN 3 THRU AN 20 AN 42 THRU AN 49 AN 73 THRU AN 81 AN 173 THRU AN 186 MS 20033 THRU MS 20046 MS 20073 MS 20074 AN 509 NK9 MS 24694 AN 525 NK525 MS 27039		MS 20004 THRU MS 20024 NAS 144 THRU NAS 158 NAS 333 THRU NAS 340 NAS 583 THRU NAS 590 NAS 624 THRU NAS 644 NAS 1303 THRU NAS 1320 NAS 172 NAS 174 NAS 517 **Steel shear bolt**: NAS 464		AN 3DD THRU AN 20DD AN 173DD THRU AN 186DD AN 509DD AN 525D MS 27039D MS 24694DD	
	NUTS Steel Tension	**Steel Shear**	**NUTS Steel Tension**	**Steel Shear**	**NUTS Alum. Tension**	**Alum. Shear**
	AN 310 AN 315 AN 363 AN 365 NAS 1021 MS 17825 MS 21045 MS 20365 MS 20500 NAS 679	AN 320 AN 364 NAS 1022 MS 17826 MS 20364	AN 310 AN 315 AN 363 AN 365 MS 17825 MS 20365 MS 21045 NAS 1021 NAS 679 NAS 1291	AN 320 AN 364 NAS 1022 MS 17826 MS 20364	AN 365D AN 310D NAS 1021D	AN 320D AN 364D NAS 1022D

Nut-bolt size	**Torque Limits in-lbs.**		**Torque Limits in-lbs.**		**Torque Limits in-lbs.**		**Torque Limits in-lbs.**		**Torque Limits in-lbs.**		**Torque Limits in-lbs.**	
	Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
8-36	12	15	7	9					5	10	3	6
10-32	20	25	12	15	25	30	15	20	10	15	5	10
1/4-28	50	70	30	40	80	100	50	60	30	45	15	30
5/16-24	100	140	60	85	120	145	70	90	40	65	25	40
3/8-24	160	190	95	110	200	250	120	150	75	110	45	70
7/16-20	450	500	270	300	520	630	300	400	180	280	110	170
1/2-20	480	690	290	410	770	950	450	550	280	410	160	260
9/16-18	800	1,000	480	600	1,100	1,300	650	800	380	580	230	360
5/8-18	1,100	1,300	660	780	1,250	1,550	750	950	550	670	270	420
3/4-16	2,300	2,500	1,300	1,500	2,650	3,200	1,600	1,900	950	1,250	560	880
7/8-14	2,500	3,000	1,500	1,800	3,550	4,350	2,100	2,690	1,250	1,900	750	1,200
1-14	3,700	4,500	2,200	3,300	4,500	5,500	2,700	3,300	1,600	2,400	950	1,500
1-1/8-12	5,000	7,000	3,000	4,200	6,000	7,300	3,600	4,400	2,100	3,200	1,250	2,000
1-1/4-12	9,000	11,000	5,400	6,600	11,000	13,400	6,600	8,000	3,900	5,600	2,300	3,650

CHART 9103. DECIMAL CONVERSION

4ths	8ths	16ths	32nds	64ths	TO 3 PLACES	TO 2 PLACES	M.M. EQUIV
				1/64	.016	.02	.397
			1/32		.031	.03	.794
				3/64	.047	.05	1.191
		1/16			.062	.06	1.587
				5/64	.078	.08	1.984
			3/32		.094	.09	2.381
				7/64	.109	.11	2.778
	1/8				.125	.12	3.175
				9/64	.141	.14	3.572
			5/32		.156	.16	3.969
				11/64	.172	.17	4.366
		3/16			.188	.19	4.762
				13/64	.203	.20	5.159
			7/32		.219	.22	5.556
				15/64	.234	.23	5.593
1/4					.250	.25	6.350
				17/64	.266	.27	6.747
			9/32		.281	.28	7.144
				19/64	.297	.30	7.540
		5/16			.312	.31	7.937
				21/64	.328	.33	8.334
			11/32		.344	.34	8.731
				23/64	.359	.36	9.128
	3/8				.375	.38	9.525
				25/64	.391	.39	9.922
			13/32		.406	.41	10.319
				27/64	.422	.42	10.716
		7/16			.438	.44	11.112
				29/64	.453	.45	11.509
			15/32		.469	.47	11.906
				31/64	.484	.48	12.303
					.500	.50	12.700

4ths	8ths	16ths	32nds	64ths	TO 3 PLACES	TO 2 PLACES	M.M. EQUIV
				33/64	.516	.52	13.097
			17/32		.531	.53	13.494
				35/64	.547	.55	13.891
		9/16			.562	.56	14.288
				37/64	.578	.58	14.684
			19/32		.594	.59	15.081
				39/64	.609	.61	15.478
	5/8				.625	.62	15.875
				41/64	.641	.64	16.272
			21/32		.656	.66	16.669
				43/64	.672	.67	17.065
		11/16			.688	.69	17.462
				45/64	.703	.70	17.859
			23/32		.719	.72	18.256
				47/64	.734	.73	18.653
3/4					.750	.75	19.050
				49/64	.766	.77	19.447
			25/32		.781	.78	19.844
				51/64	.797	.80	20.241
		13/16			.812	.81	20.637
				53/64	.828	.83	21.034
			27/32		.844	.84	21.431
				55/64	.859	.86	21.828
	7/8				.875	.88	22.225
				57/64	.891	.89	22.622
			29/32		.906	.91	23.019
				59/64	.922	.92	23.416
		15/16			.938	.94	23.812
				61/64	.953	.95	24.209
			31/32		.969	.97	24.606
				63/64	.984	.98	25.003
					1.000	1.00	25.400

CHART 9104. TORQUE CONVERSIONS TO METRIC (Sheet 1 of 2)

INCH POUNDS TO CENTIMETER KILOGRAMS (cmkg.)					
5 in.-lbs.	5.76 cmkg.	45 in.-lbs.	51.84 cmkg.	85 in.-lbs.	97.92 cmkg.
10 in.-lbs.	11.52 cmkg.	50 in.-lbs.	57.60 cmkg.	90 in.-lbs.	103.68 cmkg.
15 in.-lbs.	17.28 cmkg.	55 in.-lbs.	63.36 cmkg.	95 in.-lbs.	109.44 cmkg.
20 in.-lbs.	23.04 cmkg.	60 in.-lbs.	69.12 cmkg.	100 in.-lbs.	115.20 cmkg.
25 in.-lbs.	28.80 cmkg.	65 in.-lbs.	74.88 cmkg.	105 in.-lbs.	120.96 cmkg.
30 in.-lbs.	34.56 cmkg.	70 in.-lbs.	80.64 cmkg.	110 in.-lbs.	126.72 cmkg.
35 in.-lbs.	40.32 cmkg.	75 in.-lbs.	86.40 cmkg.	115 in.-lbs.	132.48 cmkg.
40 in.-lbs.	46.08 cmkg.	80 in.-lbs.	92.16 cmkg.	120 in.-lbs.	138.24 cmkg.
(cmkg.) CENTIMETER KILOGRAMS TO INCH POUNDS					
50 cmkg.	43.4 in.-lbs.	300 cmkg.	260.4 in.-lbs.	550 cmkg.	477.4 in.-lbs.
100 cmkg.	86.8 in.-lbs.	350 cmkg.	303.8 in.-lbs.	600 cmkg.	520.8 in.-lbs.
150 cmkg.	130.2 in.-lbs.	400 cmkg.	347.2 in.-lbs.	650 cmkg.	564.2 in.-lbs.
200 cmkg.	173.6 in.-lbs.	450 cmkg.	390.6 in.-lbs.	700 cmkg.	607.6 in.-lbs.
250 cmkg.	217.0 in.-lbs.	500 cmkg.	434.0 in.-lbs.		
FOOT POUNDS TO METER KILOGRAMS (mkg.)					
2 1/2 ft.-lbs.	.346 mkg.	67 1/2 ft.-lbs.	9.332 mkg.	165 ft.-lbs.	22.813 mkg.
5 ft.-lbs.	.691 mkg.	70 ft.-lbs.	9.678 mkg.	170 ft.-lbs.	23.504 mkg.
7 1.2 ft.-lbs.	1.037 mkg.	72 1/2 ft.-lbs.	10.024 mkg.	175 ft.-lbs.	24.195 mkg.
10 ft.-lbs.	1.383 mkg.	75 ft.-lbs.	10.369 mkg.	180 ft.-lbs.	24.887 mkg.
12 1/2 ft.-lbs.	1.728 mkg.	77 1/2 ft.-lbs.	10.715 mkg.	185 ft.-lbs.	25.578 mkg.
15 ft.-lbs.	2.074 mkg.	80 ft.-lbs.	11.060 mkg.	190 ft.-lbs.	26.269 mkg.
17 1/2 ft.-lbs.	2.419 mkg.	82 1/2 ft.-lbs.	11.406 mkg.	195 ft.-lbs.	26.960 mkg.
20 ft.-lbs.	2.765 mkg.	85 ft.-lbs.	11.752 mkg.	200 ft.-lbs.	27.652 mkg.
22 1/2 ft.-lbs.	3.111 mkg.	87 1/2 ft.-lbs.	12.097 mkg.	105 ft.-lbs.	28.343 mkg.
25 ft.-lbs.	3.456 mkg.	90 ft.-lbs.	12.443 mkg.	210 ft.-lbs.	29.034 mkg.
27 1/2 ft.-lbs.	3.802 mkg.	92 1/2 ft.-lbs.	12.789 mkg.	215 ft.-lbs.	29.726 mkg.
30 ft.-lbs.	4.148 mkg.	95 ft.-lbs.	13.134 mkg.	220 ft.-lbs.	30.417 mkg.
32 1/2 ft.-lbs.	4.493 mkg.	97 1/2 ft.-lbs.	13.480 mkg.	225 ft.-lbs.	31.108 mkg.
35 ft.-lbs.	4.839 mkg.	100 ft.-lbs.	13.826 mkg.	230 ft.-lbs.	31.800 mkg.
37 1/2 ft.-lbs.	5.185 mkg.	105 ft.-lbs.	14.517 mkg.	235 ft.-lbs.	32.491 mkg.
40 ft.-lbs.	5.530 mkg.	110 ft.-lbs.	15.208 mkg.	240 ft.-lbs.	33.182 mkg.
42 1/2 ft.-lbs.	5.876 mkg.	115 ft.-lbs.	15.900 mkg.	245 ft.-lbs.	33.873 mkg.
45 ft.-lbs.	6.222 mkg.	120 ft.-lbs.	16.591 mkg.	250 ft.-lbs.	34.565 mkg.
47 1/2 ft.-lbs.	6.567 mkg.	125 ft.-lbs.	17.282 mkg.	255 ft.-lbs.	35.256 mkg.
50 ft.-lbs.	6.913 mkg.	130 ft.-lbs.	17.974 mkg.	260 ft.-lbs.	35.947 mkg.
52 1/2 ft.-lbs.	7.258 mkg.	135 ft.-lbs.	18.665 mkg.	265 ft.-lbs.	36.639 mkg.
55 ft.-lbs.	7.604 mkg.	140 ft.-lbs.	19.356 mkg.	270 ft.-lbs.	37.330 mkg.
57 1/2 ft.-lbs.	7.950 mkg.	145 ft.-lbs.	10.047 mkg.	275 ft.-lbs.	38.021 mkg.
60 ft.-lbs.	8.295 mkg.	150 ft.-lbs.	20.739 mkg.	280 ft.-lbs.	38.713 mkg.
62 1/2 ft.-lbs.	8.641 mkg.	155 ft.-lbs.	21.430 mkg.	285 ft.-lbs.	39.404 mkg.
65 ft.-lbs.	8.987 mkg.	160 ft.-lbs.	22.121 mkg.	290 ft.-lbs.	40.095 mkg.
				295 ft.-lbs.	40.786 mkg.
				300 ft.-lbs.	41.478 mkg.

CHART 9104. TORQUE CONVERSIONS TO METRIC (Sheet 2 of 2)

(mkg.) METER KILOGRAMS TO FOOT-POUNDS					
1 mkg.	7.23 ft.-lbs.	8 mkg.	57.86 ft.-lbs.	15 mkg.	108.49 ft.-lbs.
2 mkg.	14.46 ft.-lbs.	9 mkg.	65.09 ft.-lbs.	16 mkg.	115.72 ft.-lbs.
3 mkg.	21.69 ft.-lbs.	10 mkg.	72.32 ft.-lbs.	17 mkg.	122.95 ft.-lbs.
4 mkg	28.98 ft.-lbs.	11 mkg.	79.56 ft.-lbs.	18 mkg.	130.19 ft.-lbs.
5 mkg.	36.16 ft.-lbs.	12 mkg.	86.79 ft.-lbs.	19 mkg.	137.42 ft.-lbs.
6 mkg.	43.39 ft.-lbs.	13 mkg.	94.02 ft.-lbs.	20 mkg.	144.65 ft.-lbs.
7 mkg.	50.63 ft.-lbs.	14 mkg.	101.26 ft.-lbs.	21 mkg.	151.89 ft.-lbs.
				22 mkg.	159.12 ft.-lbs.

CHART 9105. CONVERSION TABLES (NOTES)

(1) Use the following charts to convert capacities, lengths, temperatures, and various weights and measures from English to metric values or vice versa.

(2) Use the following procedure to convert inches to millimeters.

Example: Convert 1.5 inches to millimeters.

(a) Read down inches column to 1. inches.
(b) Read across top inch column to 0.5.
(c) Read down and across to find millimeters (1.5 inches is 38.10 millimeters).

(3) Use the following procedure to convert Fahrenheit (°F) and Celsius (°C) (Centigrade) temperatures.

Example:
Read number in middle column; if in degrees Celsius (°C), read Fahrenheit equivalent in right-hand column. If in degrees Fahrenheit (°F); read Celsius equivalent in left-hand column.

(a) 70°F = 21.1°C.
(b) 30°C = 86.0°F.

CHARFT 9106. METRIC CONVERSION TABLES (Sheet 1 of 3)

MULTIPLY	BY	TO OBTAIN
CENTIMETERS	0.3937	IN.
	0.03281	FT.
CU. CENTIMETERS	0.001	LITERS
	0.06102	CU. IN
	0.0002642	U.S. GAL.
CU. FT.	28.320	CU. CM
	1.728	CU. IN.
	7.481	U.S. GAL.
	28.32	LITERS
CU. IN.	16.39	CU. CM
	0.01639	LITERS
	0.004329	U.S. GAL.
	0.01732	QUARTS
CU. METERS	1000000	CU. CM
	35.314	CU. FT.
	61.023	CU. IN
	264.17	GAL.
	999.97	LITERS
FEET	0.3048	METERS
	12.000	MILS
	304.8	MM.
	0.3333	YARDS
FT.-LB.	0.1383	M-KG
	0.001285	BTU
	0.000000376	KW-HR
FLUID OZ.	8	DRAM
	29.6	CU. CM
GAL., IMPERIAL	277.4	CU. IN.
	1.201	U.S. GAL.
	4.546	LITERS
GAL., U.S. DRY	268.8	CU. IN.
	0.1556	CU. FT.
	1.164	U.S. GAL., LIQ.
	4.405	LITERS
GAL., U.S. LIQ.	231.0	CU. IN.
	0.1337	CU. FT.
	3.785	LITERS
	0.8327	IMPERIAL GAL.
	128	FLUID OZ.
IN.	2.540	CM.
	.08333	FT.
JOULES	0.000948	BTU
	0.7376	FT.-LB.

MULTIPLY	BY	TO OBTAIN
KILOGRAMS	2.205	LB.
	35.27	OZ.
	1000	GRAMS
LITERS	1000	CU. CM.
	61.03	CU. IN.
	0.03532	CU. FT.
	0.2642	U.S. GAL.
	0.22	IMPERIAL GAL.
	1.057	QUARTS
METERS	39.37	IN.
	3.281	FT.
	1000	MM.
METER-KILOGRAM	7.233	FT.-LB.
	9.807	JOULES
OUNCES, AVDP	0.0625	LB., AVDP
	28.35	GRAMS
	437.5	GRAINS
OUNCES, FLUID	29.57	CU. CM.
	1.805	CU. IN.
LB., AVDP	453.6	GRAMS
	7000	GRAINS
	16.0	OUNCES
SQUARE INCH	6.4516	SQ. CM.
POUND PER SQUARE INCH (PSI)	0.0703	KG.-CM SQUARED
STATUTE MILE	1.609	KILOMETER
	0.8684	NAUTICAL MILE
NAUTICAL MILE	1.151	STATUTE MILE
QUART	.9463	LITER
MILLIMETER	1000	MICRON
MICRON	0.001	MILLIMETER
	0.000039	INCH
INCH POUNDS	11.521	METER GRAMS
INCH OUNCES	0.72	METER GRAMS
POUNDS	0.453	KILOGRAMS

CHARFT 9106. METRIC CONVERSION TABLES (Sheet 2 of 3)

CENTIGRADE - FAHRENHEIT CONVERSION TABLE

Example: To convert 20°C, to Fahrenheit, find 20 in the center column headed (°F - °C); then read 68.0°F, in the column (°F) to the right. To convert 20°F, to Centigrade; find 20 in the center column and read -6.67°C, in the (°C) column to the left.

°C	°F - °C	°F	°C	°F - °C	°F
-56.7	-70	-94.0	104.44	220	428.0
-51.1	-60	-76.0	110.00	230	446.0
- 45.6	-50	-58.0	115.56	240	464.0
- 40.0	-40	-40.0	121.11	250	482.0
- 34.0	-30	-22.0	126.67	260	500.0
- 38.9	-20	-4.0	132.22	270	518.0
- 23.3	-10	14.0	137.78	280	536.0
- 17.8	0	32.0	143.33	290	554.0
-12.22	10	50.0	148.89	300	572.0
-6.67	20	68.0	154.44	310	590.0
-1.11	30	86.0	160.00	320	608.0
4.44	40	104.0	165.56	330	626.0
10.00	50	122.0	171.11	340	644.0
15.56	60	140.0	176.67	350	662.0
21.11	70	158.0	182.22	360	680.0
26.67	80	176.0	187.78	370	698.0
32.22	90	194.0	193.33	380	716.0
27.78	100	212.0	198.89	390	734.0
43.33	110	230.0	204.44	400	752.0
38.89	120	248.0	210.00	410	770.0
54.44	130	266.0	215.56	420	788.0
60.00	140	284.0	221.11	430	806.0
65.56	150	302.0	226.67	440	824.0
71.00	160	320.0	232.22	450	842.0
76.67	170	338.0	257.78	460	860.0
82.22	180	356.0	243.33	470	878.0
87.78	190	374.0	248.89	480	896.0
93.33	200	392.0	254.44	490	914.0
98.89	210	410.0	260.00	500	932.0

CHARFT 9106. METRIC CONVERSION TABLES (Sheet 3 of 3)

INCHES TO MILLIMETER

INCHES	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009
					MILLIMETER					
0.000		0.0025	0.0050	0.0076	0.0101	0.0127	0.0152	0.0177	0.0203	0.0228
0.001	0.0254	0.0279	0.0304	0.0330	0.0355	0.0381	0.0406	0.0431	0.0457	0.0482
0.002	0.0508	0.0533	0.0558	0.0584	0.0609	0.0635	0.0660	0.0685	0.0711	0.0736
0.003	0.0762	0.0812	0.0838	0.0863	0.0889	0.0914	0.0939	0.0965	0.0965	0.0990
0.004	0.1016	0.1041	0.1066	0.1092	0.1117	0.1143	0.1168	0.1193	0.1219	0.1244
0.005	0.1270	0.1295	0.1320	0.1346	0.1371	0.1397	0.1422	0.1447	0.1447	0.1498
0.006	0.1524	0.1549	0.1574	0.1600	0.1625	0.1651	0.1676	0.1701	0.1727	0.1752
0.007	0.1778	0.1803	0.1828	0.1854	0.1879	0.1905	0.1930	0.1955	0.1981	0.2006
0.008	0.2032	0.2057	0.2082	0.2108	0.2133	0.2159	0.2184	0.2209	0.2235	0.2260
0.009	0.2286	0.2311	0.2336	0.2362	0.2387	0.2413	0.2438	0.2463	0.2489	0.2514

INCHES	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
					MILLIMETER					
0.00		0.025	0.050	0.076	0.101	0.127	0.152	0.177	0.203	0.228
0.01	0.254	0.279	0.304	0.330	0.355	0.381	0.406	0.431	0.457	0.482
0.02	0.508	0.533	0.558	0.584	0.609	0.635	0.660	0.685	0.711	0.736
0.03	0.762	0.787	0.812	0.838	0.863	0.889	0.914	0.939	0.965	0.990
0.04	1.016	1.041	1.066	1.092	1.117	1.143	1.168	1.193	1.219	1.244
0.05	1.270	1.295	1.320	1.346	1.371	1.397	1.422	1.447	1.473	1.498
0.06	1.524	1.549	1.574	1.600	1.625	1.651	1.676	1.701	1.727	1.752
0.07	1.778	1.803	1.828	1.854	1.879	1.905	1.930	1.955	1.981	2.006
0.08	2.032	2.057	2.082	2.108	2.133	2.159	2.184	2.209	2.235	2.260
0.09	2.286	2.311	2.336	2.362	2.387	2.413	2.438	2.463	2.489	2.514

INCHES	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
					MILLIMETER					
0.0		0.254	0.508	0.762	0.016	1.270	1.524	1.778	2.032	2.286
0.1	2.540	2.794	3.048	3.302	3.556	3.810	4.064	4.318	4.572	4.826
0.2	5.080	5.334	5.558	5.842	6.096	6.350	6.604	6.858	7.112	7.366
0.3	7.620	7.874	8.128	8.382	8.636	8.890	9.144	9.398	9.652	9.906
0.4	10.160	10.414	10.668	10.922	11.176	11.430	11.684	11.938	12.192	12.446
0.5	12.700	12.954	13.208	13.462	13.716	13.970	14.224	14.478	14.732	14.986
0.6	15.240	15.494	15.748	16.002	16.256	16.510	16.764	17.018	17.272	17.526
0.7	17.780	18.034	18.288	18.542	18.796	19.050	19.304	19.558	19.812	20.066
0.8	20.320	20.574	20.828	21.082	21.336	21.590	21.844	22.098	22.352	22.606
0.9	22.860	23.114	23.368	23.622	23.876	24.130	24.384	24.638	24.892	25.146

INCHES	0.00	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
					MILLIMETER					
0.		2.54	5.08	7.62	10.16	12.70	15.24	17.78	20.32	22.86
1.	25.40	27.94	30.48	33.02	35.56	38.10	40.64	43.18	45.72	48.26
2.	50.80	53.34	55.88	58.42	60.96	63.50	66.04	68.58	71.12	73.66
3.	76.20	78.74	81.28	83.82	86.36	88.90	91.44	93.98	96.52	99.06
4.	101.60	104.14	106.68	109.22	111.76	114.30	116.84	119.38	121.92	124.46
5.	127.00	129.54	132.08	134.62	137.16	139.70	142.24	144.78	147.32	149.86
6.	152.40	154.94	157.48	160.02	162.56	165.10	167.64	170.18	172.72	175.26
7.	177.80	180.34	182.88	185.42	187.96	190.50	193.04	195.58	198.12	200.66
8.	203.20	205.74	208.28	210.82	213.36	215.90	218.44	220.98	223.52	226.06
9.	228.60	231.14	233.68	236.22	238.76	241.30	243.84	246.38	248.92	251.46

CHART 9107. DECIMAL/MILLIMETERS EQUIVALENTS OF DRILL SIZES

Decimal/Millimeter Equivalents of Drill Sizes From 1/2" to No. 80

Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.	Size	Decimal Equiv.	Millimeter Equiv.
1/2	0.500	12.7000	G	0.261	6.6294	5/32	0.1562	3.9687	51	0.067	1.7018
31/64	0.4843	12.3031	F	0.257	6.5278	23	0.154	3.9116	52	0.0635	1.6129
15/32	0.4687	11.9062	E-1/4	0.250	6.3500	24	0.152	3.8608	1/16	0.0625	1.5875
29/64	0.4531	11.5094	D	0.246	6.2484	25	0.1495	3.7973	53	0.0595	1.5113
7/16	0.4375	11.1125	C	0.242	6.1468	26	0.147	3.7338	54	0.055	1.397
27/64	0.4218	10.7156	B	0.238	6.0452	27	0.144	3.6576	55	0.052	1.3208
Z	0.413	10.4902	15/64	0.2343	5.9531	9/64	0.1406	3.5719	3/64	0.0468	1.1906
13/32	0.4062	10.3187	A	0.234	5.9436	28	0.1405	3.5687	56	0.0465	1.1811
Y	0.404	10.2616	1	0.228	5.7912	29	0.136	3.4544	57	0.043	1.0922
X	0.397	10.0838	2	0.221	5.6134	30	0.01285	3.2639	58	0.042	1.0668
25/64	0.3906	9.9212	7/32	0.2187	5.5562	1/8	0.125	3.1750	59	0.041	1.0414
W	0.386	9.8044	3	0.213	5.4102	31	0.120	3.048	60	0.040	1.016
V	0.377	9.5758	4	0.209	5.3086	32	0.116	2.9464	61	0.039	0.9906
3/8	0.375	9.5250	5	0.2055	5.2197	33	0.113	2.8702	62	0.038	0.9652
U	0.368	9.3472	6	0.204	5.1816	34	0.111	2.8194	63	0.037	0.9398
23/64	0.3593	9.1262	13/64	0.2031	5.1594	35	0.110	2.794	64	0.036	0.9144
T	0.358	9.1281	7	0.201	5.1054	7/64	0.1093	2.7781	65	0.035	0.899
S	0.346	8.7884	8	0.199	5.0546	36	0.1065	2.7051	66	0.033	0.8382
11/32	0.3437	8.7300	9	0.196	4.9784	37	0.104	2.6416	1/32	0.0312	0.7937
R	0.339	8.6106	10	0.1935	4.9149	38	0.1015	2.5781	67	0.032	0.8128
Q	0.332	8.4328	11	0.191	4.8514	39	0.0995	2.5273	68	0.031	0.7874
21/64	0.3281	8.3337	12	0.189	4.8006	40	0.098	2.4892	69	0.029	0.7366
P	0.323	8.2042	3/16	0.1875	4.7625	41	0.096	2.4384	70	0.028	0.7112
O	0.316	8.0264	13	0.185	4.699	3/32	0.0937	2.3812	71	0.026	0.6604
5/16	0.3125	7.9375	14	0.182	4.6228	42	0.0935	2.3749	72	0.025	0.635
N	0.302	7.6708	15	0.180	4.572	43	0.089	2.2606	73	0.024	0.0696
19/64	0.2968	7.5387	16	0.177	4.4958	44	0.086	2.1844	74	0.0229	0.58166
M	0.295	7.4930	17	0.173	4.3942	45	0.082	2.0828	75	0.021	0.5334
L	0.290	7.3660	11/64	0.1718	4.3656	46	0.081	2.0574	76	0.020	0.508
9/32	0.2812	7.1425	18	0.1695	4.3053	47	0.0785	1.9939	77	0.018	0.4572
K	0.281	7.1374	19	0.166	4.2164	5/64	0.0781	1.9844	1/64	0.0156	0.3969
J	0.277	7.0358	20	0.161	4.0894	48	0.076	1.9304	78	0.016	0.4064
I	0.272	6.9088	21	0.159	4.0386	49	0.073	1.8542	79	0.0145	0.3683
H	0.266	6.7564	22	0.157	3.9878	50	0.070	1.778	80	0.0135	0.3429
17/64	0.2656	6.7462									

DRILL SIZES AVAILABLE

Drill may be obtained in regular sizes to a 4 inch diameter, and increase in 64ths of an inch. The regular metric drills vary from 2 to 76mm and increase in 0.5mm variations.

SPECIAL TOOLS

The following is a list of special tools which are helpful in performing certain mechanical procedures. A picture and description of each tool is found in the chapter listed next to the tool.

TIRE BALANCER FIXTURE	Chapter l2
AILERON AND FLAP RIGGING TOOL	Chapter 27
BELLCRANK RIGGING TOOL	Chapter 27
RUDDER RIGGING TOOL	Chapter 27
STABILATOR RIGGING TOOL	Chapter 27
FUEL QUANTITY TRANSMITTER CHECKING JIG	Chapter 28
ORIFICE REPLACEMENT TOOL	Chapter 32
RETAINER RING TOOL	Chapter 32
BAGGAGE DOOR LOCK TOOL	Chapter 52
CONTROL SURFACE BALANCING TOOL	Chapter 55

INSPECTION OF FLEXIBLE HOSES

NOTE

During the manufacturing process, a condition known as "rubber strike-through" occasionally occurs. This condition is such that rubber material protrudes through the wire braid cover. This condition has no effect on hose quality.

It is recommended that flexible hoses be inspected every 100 hours, especially those in the engine compartments. Flexible hose used in the engine compartment must be replaced each 1000 hours time-in-service or 8 years, whichever comes first. When inspecting hoses, look for the following conditions:

1. Check each installation to be sure the hose is not kinked, twisted, or distorted. Check for evidence of abrasion, cuts, and broken wires. Random broken wires are acceptable since wire breaks sometimes occur during manufacture. Discard hose if two or more broken wires are found per plait (braid) or more than six broken wires per lineal foot. Broken wires in an area where kinking is evident is also a cause for rejection.

CAUTION

Puncturing the outer cover of the hose may cause damage to the hose.

2. Check each assembly for deterioration, ply separation of cover or braid, cracks, weather checking, lack of flexibility, blisters or bulging, collapse, or sharp bending. Blisters on the outer synthetic cover do not necessarily indicate a faulty hose.
3. Remove hose from assembly if hose shows any visible wear. Inspect hose interior and check for signs of deterioration, tube collapse, cut rubber, wire braid puncture, or restriction. To inspect hoses with elbow fittings, use flexible inspection light and viewer, or inspection ball as described in Chart 9108. Replace hose if any deterioration exists.

CHART 9108. BALL DIAMETERS FOR TESTING HOSE RESTRICTIONS

Hose Size	Ball Size
- 4	5/64
- 5	9/65
- 6	13/64
- 8	9/32
- 10	3/8
- 12	1/2
- 16	47/64
- 20	61/64

CHART 9109. HOSE SPECIFICATIONS

SINGLE WIRE BRAID FABRIC COVERED

MIL PART NO.	TUBE SIZE O.D.	HOSE SIZE I.D.	HOSE SIZE O.D.	RECOMM OPER. PRESS	MIN BURST PRESS	MAX PROOF PRESS	MIN BEND RADIUS
MIL-H-8794- 3-L	3/16	1/8	.45	3,000	12,000	6,000	3.00
MIL-H-8794- 4-L	1/16	3/16	.52	3,000	12,000	6,000	3.00
MIL-H-8794- 5-L	5/16	1/4	.58	3,000	10,000	5,000	3.38
MIL-H-8794- 6-L	3/8	5/16	.67	2,000	9,000	4,500	4.00
MIL-H-8794- 8-L	1/2	13/32	.77	2,000	8,000	4,000	4.63
MIL-H-8794-10-L	5/8	1/2	.92	1,750	7,000	3,500	5.50
MIL-H-8794-12-L	3/4	5/8	1.08	1,500	6,000	3,000	6.50
MIL-H-8794-16-L	1	7/8	1.23	800	3,200	1,600	7.38
MIL-H-8794-20-L	1 1/4	1 1/8	1.50	600	2,500	1,250	9.00
MIL-H-8794-24-L	1 1/2	1 3/8	1.75	500	2,000	1,000	11.00
MIL-H-8794-32-L	2	1 13/16	2.22	300	1,400	700	13.25
MIL-H-8794-40-L	2 1/2	2 3/8	2.88	200	1,000	300	24.00
MIL-H-8794-48-L	3	3	3.56	200	800	300	33.00

Construction: Seamless synthetic rubber inner tube reinforced with one fiber braid, one braid of high tensile steel wire and covered with an oil resistant rubber impregnated fiber braid.

Identification: Hose is identified by specification number, size number, quarter year and year, hose manufacturer's identification.

Uses: Hose is approved for use in aircraft hydraulic, pneumatic, coolant, fuel and oil systems.

Operating Temperatures:
Sizes -3 thru -12: Minus 65°F. to plus 250°F.

Sizes -16 thru -48: Minus 40°F to plus 275°F.

NOTE: Maximum temperatures and pressures should not be used simultaneously.

MULTIPLE WIRE BRAID RUBBER COVERED

MIL PART NO.	TUBE SIZE O.D.	HOSE SIZE I.D.	HOSE SIZE O.D.	RECOMM OPER. PRESS	MIN BURST PRESS	MAX PROOF PRESS	MIN BEND RADIUS
MIL-H-8788- 4-L	1/4	7/32	.63	3,000	16,000	8,000	3.00
MIL-H-8788- 5-L	5/16	9/32	.70	3,000	14,000	7,000	3.38
MIL-H-8788- 6-L	3/8	11/32	.77	3,000	14,000	7,000	5.00
MIL-H-8788- 8-L	1/2	7/16	.86	3,000	14,000	7,000	5.75
MIL-H-8788-10-L	5/8	9/16	1.03	3,000	12,000	6,000	6.50
MIL-H-8788-12-L	3/4	11/16	1.22	3,000	12,000	6,000	7.75
MIL-H-8788-16-L	1	7/8	1.50	3,000	10,000	5,000	9.63

Hose Construction: Seamless synthetic rubber inner tube reinforced with one fabric braid, two or more steel wire braids, and covered with a synthetic rubber cover (for gas applications, request perforated cover).

Identification: Hose is identified by specification number, size number, quarter year and year, hose manufacturer's identification.

Uses: High pressure hydraulic, pneumatic, coolant, fuel and oil.

Operating Temperature:
Minus 65°F to plus 200°F.

CHART 9110. CONSUMABLE MATERIALS (Sheet 1 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
ABS-Solvent / Cements		Solarite, #11 Series	Solar Compounds Corp.
Adhesive		EC 801 EC 807 EC 1357 Scotch Grip 210 (Rubber Adhesive)	Minnesota Mining and Manufacturing Adhesive Coating and Sealers Division
Anti-Galling Solution	MIL-A-907	Ease-Off	Taxacone Company
Anti-Seize Compound (Graphite Petrolatum)	MIL-T-5544	Armite Product	Armite Laboratories
		Anti-Seize Compound	Exxon Oil Company
		Royco 44	Royal Lubricants Co.
Anti-Seize Compound (White Lead Base)	TT-A-580 (JAN-A-669)	Armite Product	Armite Laboratories
Anti-Seize Thread Compound "HIGH TEMPERATURE"		Fel-Pro C5-A	Fel-Pro Incorporated
Buffing and Rubbing Compounds		Automotive Type DuPont #7	DuPont Company
		Ram Chemical #69	Ram Chemicals
Compound for Polishing		Mirror Glaze	Mirror Bright Polish Co., Incorporated
Plexiglas Polish and Cleaner	P-P-560	Part Number 403D	Permatex Co., Inc. Kansas City, Kansas 66115
Cleaners		Fantastic Spray Perchlorethylene VM&P Naphtha (Lighter Fluid)	Local Supplier
Deicer Boot Surface Coatings		Agemaster	B.F. Goodrich

CHART 9110. CONSUMABLE MATERIALS (Sheet 2 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Epoxy Patching Compound		Solarite #400	Solar Compounds Corp.
Gasket Cement		Permatex No. 2	Permatex Company, Inc.
Grease, Actuator		2196-74-1	Dukes Astronautics Co.
Grease, Aircraft Instrumentation, Gear and Actuator Screw (Temp. Range (100°F to +250°F)	MIL-G-23827A (See Note 1)	Supermil Grease No. A72832	Amoco
		Royco 27A	Royal Lubricants Co.
		Shell 6249 Grease	Shell Oil Company
		RR-28	Socony Mobil Oil Co.
		Castrolease A1	Burmah-Castrol LTD.
		Low-Temp. Grease E.P.	Texaco Incorp.
		5114 E.P. Grease AV55	Standard Oil of Calif.
		Aeroshell Grease 7 Braycote 627S	Shell Oil Company
		Mobil Grease 27	Mobil Oil Corporation
		B.P. Aero Grease 31B	B.P. Trading Limited
Grease, Aircraft Instrumentation, Gear and Actuator Screw (Temp. Range 65°F to +250°F)	MIL-G-3278	Unitemp E.P.	Texaco Incorporated
		RPM Aviation Grease 5, Supermil Grease No. 8723.	Standard Oil of Calif.
		Aeroshell Grease 7A	Shell Oil Corporation
		Royco 78	Royal Lubricants Company
		L-1212	Sinclair Refining Co.
		1916 Uni-Temp Grease	California Texas Oil Corporation

CHART 9110. CONSUMABLE MATERIALS (Sheet 3 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Grease Ball and Roller Bearing	MIL-G-18709	Regal ASB-2 Formula TG-10293	Texaco Incorporated
		Andok B	Exxon Company, U.S.A.
		Code 1-20481, Darina Grease 1 XSG-6213 Code 71-501, Darina Grease 2 XSG-6152 Code 71-502, Alvania Grease 2 XSG-6151 Code 71-012, Cyprina Grease 3 XSG-6280 Code 71-003	Shell Oil Company
Grease, General Purpose Wide Temperature	MIL-G-81322	Marfax All Purpose	Texaco Incorporated
		Aeroshell No. 6	Shell Oil Company
		Mobil Grease 77 or Mobilux EP2	Mobil Oil Corporation
		Shell Alvania EP2	Shell Oil Company
		Royco 22	Royal Lubricants Company
		Mobil Grease 28	Mobil Oil Corporation
		Aeroshell No. 22	Shell Oil Company
Grease, High temperature	MIL-G-3545	High Temp. Grease, Marfak All Purpose	Texaco Incorporated
		Shellaire Grease HT Alvania E.P. Grease 2 Aeroshell Grease 5	Shell Oil Company
		Grease 77, Mobilux E.P. 2	Mobil Oil Corporation
		Royco 45A	Royal Lubricants Co.
		L-1231	Sinclair Refining Company

CHART 9110. CONSUMABLE MATERIALS (Sheet 4 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Grease, Aircraft General Purpose	MIL-G-7711	Regal AFB2 Regal Starfak Premium	Texaco Incorporated
		PED 3040	Standard Oil of Calif.
		Aeroshell Grease 6	Shell Oil Company
		Royco II	Royal Lubricants Co.
Grease, Lubricating, Molybdenum Disulfide, Low and High Temperature	MIL-G-21164	Aeroshell Grease No. 17	Shell Oil Company
		Royco 64C	Royal Lubricants Co.
		Castrolease MSA (c)	Burmah Castrol LTD.
Grease, Lubricating, Plug Valve, Gasoline and Oil Resistant	MIL-G-6032	Royco 32	Royal Lubricant Co.
		Castrolease PV	Burmah Castrol LTD.
		Parker Fuel Lube 44	Parker Seal Company
		B.P. Aero Grease 32	B.P. Trading Limited
		L-237	Lehigh Tenneco Chemicals Co., Inc.
		Rockwell 950	Rockwell International
Grease, Waterproof, High and Low Temperature		Aero Lubriplate	Fiske Brothers Refining Company
"Hot Melt" Adhesive Polyamids and "Hot Melt" Gun	Stick Form 1/2 in. diameter, 3 in. long		Sears, Roebuck and Company or most hardware stores.
Hydraulic Fluid	MIL-H-5606	Brayco 756D	Bray Oil Company
		TL-5874	Texaco Incorporated
		PED 3565	Standard Oil Company of California

CHART 9110. CONSUMABLE MATERIALS (Sheet 5 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Hydraulic Fluid (cont.)	MIL-H-5606	Aircraft Hydraulic Oil AA	Texaco Incorporated
		RPM Aviation Oil No. 2 Code PED 2585 PED 3337	Standard Oil Company of California
		3126 Hydraulic Oil (Univis 40)	Exxon Company U.S.A.
		Aeroshell Fluid 4, SL-7694	Shell Oil Company
		Aero HF	Mobil Oil Corporation
		Royco 756, 756A and 756B	Royal Lubricants Co.
Isopropyl Alcohol	Fed. Spec. TT-I-735		Local Supplier
Isocryl Tape	(PMS-C1012-2)		Schnee Moorehead Chemicals, Incorporated
Kevlar		Kevlar	Kevlar Special Products
Leak Detector Solution for Oxygen Systems	MIL-L-25567	ALPHA 73 Oxygen Leak Detector Type 1	U.S. Gulf Corporation
		Leak Tec #16-OX	American Gas and Chemical Co. LTD.
Loctite	MIL-S-22473 Grade AA	Loctite 290	Loctite Corporation
	MIL-S-22473 Grade H and HV	Loctite 222	
Methylethylketone	Fed. Spec. TT-M-261		Local Supplier
Molybdenum Disulfide	MIL-M-7866	Molykote-Type G (Paste)	Dow Corning Corp.
		Molykote - Type 2 (Powder)	

CHART 9110. CONSUMABLE MATERIALS (Sheet 6 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Oil, Air Conditioner		Frigidaire #525	Virginia Chemical
		Suniso #5	Sun Oil Company of Pennsylvania
		Texaco Capilla "E"	Texaco Incorporated
		Retro-Fix PAG 21941	Climate Control
Oil Lubricating, General Purpose, Low Temperature	MIL-L-7870	Caltex Low Temp. Oil	Caltex Oil Products Company
		Sinclair Aircraft Orbit Lube	Sinclair Refining Company
		1692 Low Temp Oil	Texaco Incorporated
		Aviation Instrument Oil	Standard Oil Company of California
		Royco 363	Royal Lubricants Co.
Rain Repellent	FSCM 50150	Repcon	Unelco Corporation
Safety Walk Pressure Sensitive		Flextred 300	Wooster Products, Incorporated
Sealant	MIL-S-11031B	PRC 5000 PRC 383	Products Research Company
Sealant, Fuel Tank Sealing		RS-36b, Stripper (thin)	CEE BEE Chemical Co.
		RS-24b, Stripper (thick)	
		PR 1422 A-2 Sealant (Brushing Consistency)	Products Research Company
		PR 1422 B-2 Sealant (Trowling Consistency)	
		PR 1431G, Faying Surface Seal, Type 1	

CHART 9110. CONSUMABLE MATERIALS (Sheet 7 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Sealant, Fuel Tank Sealing (cont.)		PR 1321-B 1/2, Access Panel Sealant	Products Research Company
		PR 1560 MK, Primer (Anti-Bacteriological Coating)	
		BJO-0930, Phenolic Balloons	Union Carbide Plastics Division
		ERL-2795, Epoxy Resin	
		22LA-0340 Polyamid Hardener	
Sealant, Fuselage Structure	Class A-1/2, A-2, B-2 B-4, B-6, B-8		H.S. Bancroft Corp.
		EC 1239	Minnesota Mining and Manufacturing Industrial Specialties Division
		EC 612 (Leak Marker or Weatherstripping, etc)	
		G.E.-SS-4004 (Primer) RTV-88 with RTV-9811	General Electric Silicone Products Department
Windshield	MIL-S-7502B B-1/4, B-1/2, B-2, B-4, B-8,B-12	PR 1221	Products Research Company
		PR 1425	
Sealing Compound, Gasket and Joint		Tite-Seal	Radiator Specialty Co.
Sealer		PR 1321 B-1/2	Products Research Company

Island Enterprises

CHART 9110. CONSUMABLE MATERIALS (Sheet 8 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Silicone Compound	MIL-S-8660 (MIL-C-21567)	DC-4, DC-6 Compound	Dow Corning
		G-624	General Electric Co. Silicone Products Department
Solvents		Methylethyl Ketone Methylene Chloride Acetone	Local Suppliers
		Y2900	Union Carbide; Plastic Division
	Fed. Spec. PD 680 Type I - Stoddard Solvent		Local Supplier
	Type II - High Temperature		Local Supplier
Propeller Slip Ring Cleaning Solvent		CRC-2-26	Corrosion Reaction Consultants, Inc.
Toluol	TT-M-261		Local Supplier
Trichlorethylene	MIL-T-7003	Perm-A-Clor	Dextrex Chemical Industries, Inc.
		Turco 4217	Turco Products, Inc.
Teflon Tape	0.003” x0 .5” wide/-1		Minnesota Mining and Manufacturing Company
			Shamban W.S. and Co.
	.003" x .25" wide/-2		Johnson & Johnson, Inc. Permacel Division
Thread Sealant for High Pressure Oxygen System	MIL-T-27730	Permacel 412	Johnson & Johnson, Inc. Permacel Division

CHART 9110. CONSUMABLE MATERIALS (Sheet 9 of 9)

MATERIAL	SPECIFICATION	PRODUCT	VENDOR
Vinyl Foam	1 in. x 1/8 in.	530 Series, Type I	Norton Tape Division
Vinyl, Foam Tape	1/8 in. x 1 in.	501 Series, Type II	Norton Tape Division
Vinyl, Black Plastic	2 in. x 9 mil. and/or 1 1/2 in. x 9 mil.		
Corrosion Retardant Compounds	MIL-C-16173 D (Piper P/N 197-508)	LPS-3 Heavy Duty Rust Inhibitor	Holt Lloyd Corp.
	(Piper P/N 197-509)	Metal Parts Protector Flex	Chemi-Cap. Chemical Packaging Corp.

NOTE: Take precautions when using MIL-G-23827 and engine oil. These lubricants contain chemicals harmful to painted surfaces.

CHART 9111 VENDER INFORMATION (SHEET 1 OF 3)

A

American Gas and Chemical Co. LTD
220 Pegasus Avenue
Northvale, NJ 07647
201-767-7300

Amoco Oil Co.
200 E. Randolph Drive
Chicago, IL 60601
312-856-5111

Armite Laboratories
1845-49 Randolph Street
Los Angeles, CA 90001
213-587-7744

B

BP Trading Limited
Moore Lane
Brittanic House
London E.C. 2
England

Bray Oil Company
1925 N. Marianna Avenue
Los Angeles, CA 98103
213-268-6171

Burmah - Castrol Inc.
30 Executive Avenue
Edison, NJ 08817
201-287-3140

C

California Texas Oil Corp.
380 Madison Avenue
New York, NY 10017

Caltex Oil Products Co.
New York, NY 10020

CEE BEE Chemical Co.
9520 E. CEE BEE Drive
Box 400
Downey, CA 92041

Chemi-cap
Chemical Packaging Corp.
1100 N.W. 70th Street
Ft. Lauderdale, FL 33309
305-665-9059

Climate Control
2120 N. 22nd Street
Decauter, IL 62585
217-422-0055

Corrosion Reaction Consultants, Inc.
Limekin Pike
Dresher, PA 19025

D

Dextrex Chemical
P. O. Box 501
Detroit, MI 48232

Dow Corning Corporation
Alpha Molykote Plant
64 Harvard Avenue
Stanford, CT 06902

CHART 9111 VENDER INFORMATION (SHEET 2 OF 3)

Dukes Astronautics Co.
7866 Deering Avenue
Canoga Park, CA 91304

DuPont Company
Finishes Div.
DuPont Building
Wilmington, DE 19898
302-774-1000

E

Exxon Oil Company
1251 Avenue of the Americas
New York, NY 10020
212-398-3093

F

Fel-Pro Incorporated
7450 N. McCormick Blvd.
Box C1103
Skokie, IL 60076
312-761-4500

Fiske Brothers
Refining Company
120 Lockwood Street
Newark, NJ 07105
201-589-9510

G

General Electric Co.
Silicone Products Dept.
Waterford, NY 12188
518-237-3330

H

H. S. Bancroft Corp.
One Rockhill
Industrial Park
Cherry Hill, NJ 08003
609-854-8000

Holt Lloyd Corp.
4647 Hugh Howell Rd.
Tucker, GA 30084
404-934-7800

J

Johnson & Johnson, Inc.
Permacel Division
501 George Street
New Brunswick, NJ 08901
201-524-0400

K

Kevlar Special Products
E.I. DuPont de
Nemours & Co., (Inc.)
Textile Fibers
Department
Centre Road Building
Wilmington, DE 19898
302-999-3156

L

Lehigh - Tenneco Chemicals
Co., Inc.
Chestertown, MD 21620
301-778-1991

Loctite Corporation
777 N. Mountain Road
Newington, CT 06111
800-243-8160
In CT 800-842-0225

M

Minnesota Mining and Mfg.
3M Center
St. Paul, MN 55144
612-733-11102

Mirror Bright Polish Co., Inc.
Irvine Industrial Complex
P.O. Box 17177
Irvin, CA 92713
714-557-9200

Mobil Oil Corporation
150 E. 42nd Street
New York, NY 10017
212-883-4242

N

Norton Tape Division
Department 6610
Troy, NY 12181
518-273-0100

P

Parker Seal Company
17325 Euclid Avenue
Cleveland, OH 44112
216-531-3000

Permatex Co., Inc.
P.O. Box 11915
Newington, CT 06111
203-527-5211

Products Research Co.
2919 Empire Avenue
Burbank, CA 91504
213-849-3992

R

Radiator Specialty Co.
P.O. Box 34689
Charlotte, NC 28234
704-377-6555

CHART 9111 VENDER INFORMATION (SHEET 3 OF 3)

Ram Chemicals
201 E. Alondra Blvd.
Gardena, CA 90248
213-321-0710

Rockwell International
600 Grant Street
Pittsburgh, PA 152195
412-565-2000

Royal Lubricants Company
River Road
E. Hanover, NJ 07936
201-887-3100

S

Schnee Moorhead Chemicals, Inc.

Shamban W.S. and Co.
1857 Centinela Avenue
Santa Monica, CA 90404
213-397-2195

Shall Oil Company
One Shell Plaza
Houston, TX 77003
713-220-6697

Sinclair Refining Co.
600 Fifth Avenue
New York, NY 10020

Socony Mobil Oil Co.
Washington 5, DC 20005
Solar Compounds Corp.
1201 W. Blancke Street
Linden, NJ 07036
201-862-2813

Standard Oil of California
225 Bush Street
San Francisco, CA 94104
415-894-7700

Sun Oil Company of Penna.
Penn Center Plaza
Philadelphia, PA 19103
215-972-2000

T

Taxacone Company
P.O. Box 10823 TR
Dallas, TX 75208

Texaco, Inc.
2000 Westchester Avenue
White Plains, NY 10650
914-253-4000

Turco Products Inc.
24600 S. Main Street
Box 6200
Carson, CA 90749
213-835-8211

U

U.S. Gulf Corp.
P.O. Box 233
Stoney Brook, NY 11790
212-683-9221

Unelko Corporation
727 E. 110th Street
Chicago, IL 60628

Union Carbide; Plastic Div.
270 Park Avenue
New York, NY 10017
212-551-3763

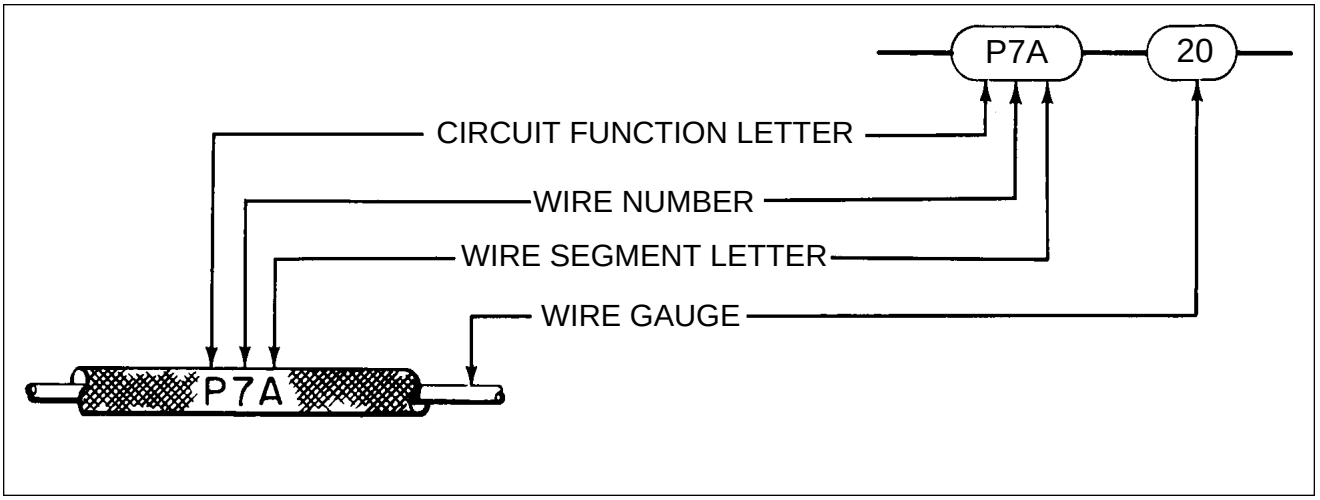
V

Virginia Chemical
3340 W. Norfolk Rd.
Portsmouth, VA 23703
703-484-5000

W

Wooster Products, Inc.
1000 Spruce Street
Wooster, OH 44691
800-321-4936
In OH 216-264-2844

CHART 9112. ELECTRICAL WIRING CODING



CIRCUIT FUNTION LETTER	CIRCUITS
A	AUTOPILOT
C	CONTROL SURFACE
F	FLIGHT INSTRUMENT
G	LANDING GEAR
H	HEATER - VENTILATING & DEICING
L	LIGHTING
P	POWER
Q	FUEL, OIL & ENGINE INSTRUMENT
RP	RADIO POWER
RZ	RADIO AUDIO
J	IGNITION
W	WARNING
K	STARTER

CHART 9113. ELECTRICAL SYMBOLS (SHEET 1 OF 2)

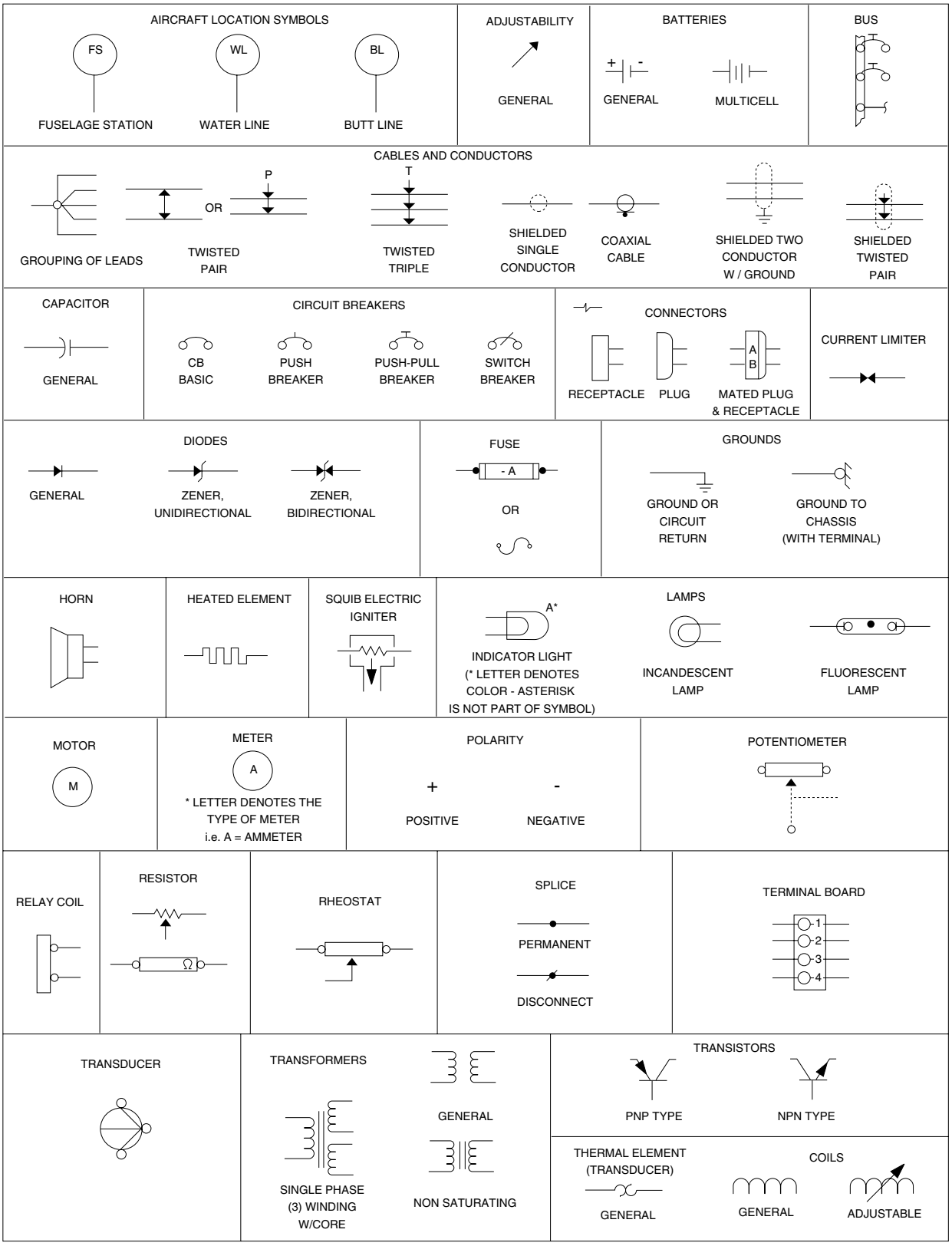
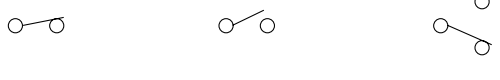


CHART 9113. ELECTRICAL SYMBOLS (SHEET 2 OF 2)

CONTACT SWITCH ASSEMBLIES
BASIC



CLOSED CONTACT | OPEN CONTACT | TRANSFER

PUSH BUTTON

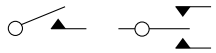
(MAKE) CIRCUIT CLOSING

MOMENTARY OR SPRING RETURN

(BREAK) CIRCUIT OPENING

TWO CIRCUIT

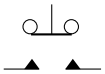
NON-LOCKING



(MAKE) CIRCUIT CLOSING | (MAKE OR BREAK) CIRCUIT CLOSING OR OPENING

(BREAK) CIRCUIT OPENING

MOMENTARY OR SPRING RETURN

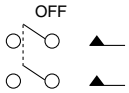


TWO CIRCUIT

TRANSFER

LOCKING AND NON-LOCKING

THREE POSITION ONE POLE

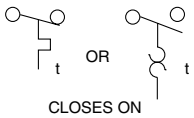


THREE POSITION TWO POLE

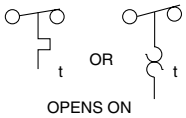
PRESSURE OR VACUUM ACTUATED SWITCH

CLOSES ON RISING PRESSURE | OPENS ON RISING PRESSURE

TEMPERATURE ACTUATED



CLOSES ON RISING TEMPERATURE



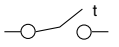
OPENS ON RISING TEMPERATURE

NOTE: t* SYMBOL SHALL BE REPLACED BY DATA GIVING THE OPERATING TEMPERATURE OF THE DEVICE

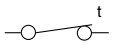
LIMIT SWITCH, DIRECTLY ACTUATED - SPRING RETURN

NORMALLY OPEN | NORMALLY OPEN HELD CLOSED | NORMALLY CLOSED | NORMALLY CLOSED HELD OPEN

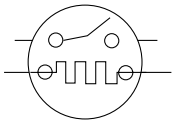
THERMAL SWITCHES



NORMALLY OPEN CLOSES ON RISING TEMPERATURE



NORMALLY CLOSED OPENS ON RISING TEMPERATURE

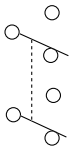


NORMALLY OPEN INTERNAL HEATER SHOWN

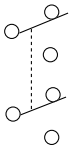
SELECTOR OR MULTI - POSITION SWITCH

ANY NUMBER OF TRANSMISSION PATHS MAY BE SHOWN

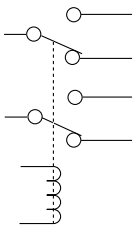
EXAMPLE
ON-ON-ON SWITCH ACUTATION



TOGGLE IN THE DOWN POSITION

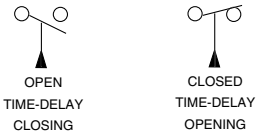


TOGGLE IN THE UP POSITION



EXAMPLE OF RELAY

SWITCHES WITH TIME/DELAY FEATURE

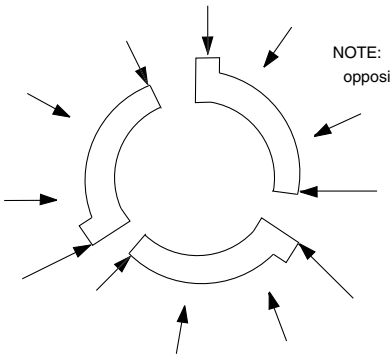


OPEN TIME-DELAY CLOSING | CLOSED TIME-DELAY OPENING

OPEN TIME-DELAY OPENING | CLOSED TIME-DELAY CLOSING

ARROW INDICATES DIRECTION OF SWITCH OPERATION IN WHICH CONTACT ACTION IS DELAYED

ROTARY SWITCH



NOTE: Viewed from end opposite control knob.

GRIDS 3J10 THROUGH 3L24
INTENTIONALLY LEFT BLANK

AIRPLANE

MAINTENANCE MANUAL

CARD 4 OF 4

PA-28-181
ARCHER II
ARCHER III

PIPER AIRCRAFT CORPORATION

(PART NUMBER 761 679 **July 30, 1994**

4A1

Island Enterprises

Published by
Technical Publications

Piper Aircraft Corporation
2926 Piper Drive
Vero Beach, Florida 32960
U.S.A.

Member of GAMA
General Aviation
Manufacturers Association

4A2

Island Enterprises

INTRODUCTION

AEROFICHE EXPLANATION AND REVISION STATUS

The Maintenance Manual information incorporated in this set of Aerofiche cards has been arranged in accordance with the general specifications of Aerofiche adopted by the General Aircraft Manufacturer's Association (GAMA).

Conversion of Aerofiche alpha/numeric code numbers:
First number is the Aerofiche card number.
Letter is the horizontal line reference per card.
Second number is the vertical line reference per card.
Example: 2J16 = Aerofiche ,card number two of given set, Grid location J16.

The following is provided to aid in locating the various chapters and related service information desired.

1. A complete manual System/Chapter Index Guide is given at Grids A8 thru A9 of all fiche in this set.
2. A complete list of Illustrations is given at Grids A10 thru A14 of all fiche in this set.
3. A complete list of Charts is given at Grids A15 and A16 of all fiche in this set:
4. A complete list of paragraph titles and appropriate Grid location numbers is given at the beginning of each Chapter relating to the information within that Chapter.
5. Identification of Revised Material.

   Revised text and illustrations are indicated by a black vertical line along the left hand margin of the frame, opposite revised, added or deleted material. Revision lines indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation, indexing, the physical location of material or complete page additions are not identified by revision lines.
6. Revisions to this Maintenance Manual 761 679, issued August 16, 1978, are as follows:

Revisions	Date	Aerofiche Card Effectivity
ORG780816	August 16,1978	—
CR870801	September 16, 1987	1, 2 and 3
CR940731	July 31. 1994	1, 2, 3 and 4

The date on Aerofiche cards should not be earlier than the date noted for the respective card effectivity. Consult the latest Aerofiche card in this series for current Aerofiche card effectivity.

VENDOR PUBLICATIONS.

— WARNING —

When servicing or inspecting vendor equipment installed in Piper aircraft, it is the user's responsibility to refer to the applicable vendor publication.

ENGINE:

Overhaul Manual = AVCO LYCOMING - OVERHAUL MANUAL
DIRECT DRIVE ENGINE - P/N 60294-7
Avco Lycoming Division
Williamsport, PA 17701

Parts Catalog = AVCO LYCOMING - P/N PC-102
Avco Lycoming Division
Williamsport, PA 17701

Operators Handbook = AVCO LYCOMING O-360
SERIES AIRCRAFT ENGINES - P/N 60297-9
Avco Lycoming Division
Williamsport, PA 17701

PROPELLER:

Repair Manual = METAL PROPELLER REPAIR MANUAL
Sensenich Corporation
P.O. Box 1168, Lancaster, PA 17604

MAGNETOS:

Service Manual = SLICK-AIRCRAFT MAGNETOS
Catalog and Service Manual
SLICK ELECTRO Inc
Rockford, IL 61101

WHEEL AND STRUT FAIRINGS:

Repair Manual = A.B.S. THERMOPLASTIC LANDING GEAR
WHEEL AND STRUT FAIRING REPAIR
INSTRUCTION MANUAL - P/N 761 708
Vero Beach Service Sales Department
Piper Aircraft Corporation
Vero Beach, Florida 32960

DRY AIR PUMPS:

Service Information = AIRBORNE DIVISION
AIR AND FUEL PRODUCTS
Parker Hannifin Corporation
711 Taylor St.
Elyria, OH 44036

AUTO FLIGHT:

SEE CHAPTER 22 AUTO FLIGHT

SERIAL NUMBER INFORMATION

PA-28-181, ARCHER II - 1976
Serial Numbers 28-7690001 to 28-7690479 inclusive
PA-28-181, ARCHER II - 1977
Serial Numbers 28-7790001 to 28-7790607 inclusive
PA-28-181, ARCHER II -1978
Serial Numbers 28-7890001 to 28-7890564 inclusive
PA-28-181, ARCHER II - 1979
Serial Numbers 28-7990001 to 28-7990626 inclusive
PA-28-181, ARCHER II - 1980
Serial Numbers 28-8090001 to 28-8090382 inclusive
PA-28-181, ARCHER II - 1981
Serial Numbers 28-8190001 to 28-8190336 inclusive
PA-28-181, ARCHER II - 1982
Serial Numbers 28-8290001 to 28-8290188 inclusive
PA-28-181, ARCHER II - 1983
Serial Numbers 28-8390001 to 28-8390090 inclusive
PA-28-181, ARCHER II - 1984
Serial Numbers 28-8490001 to 28-8490112 inclusive
PA-28-181, ARCHER II - 1985
Serial Numbers 28-8590001 to 28-8590092 inclusive
PA-28-181, ARCHER II - 1986
Serial Numbers 28-8690001 to 28-8690056 inclusive
Serial Numbers 2890001 to 2890205*
PA-28-181, ARCHER III
Serial Numbers 2890206 and up

*New method of assigning serial numbers used.

GAMA SYSTEM/CHAPTER INDEX GUIDE

SYST CHAP	SUB-SYST SECTION TITLE	AEROFICHE GRID NO.
4	AIRWORTHINESS	1A17
5	TIME LIMITS/MAINT CHECKS	1A21
6	DIMENSIONS AND AREAS	1B15
7	LIFTING AND SHORING	1C4
8	LEVELING AND WEIGHING	1C9
9	TOWING AND TAXIING	1C14
10	PARKING AND MOORING	1C18
11	PLACARDS AND MARKINGS	1C22
12	SERVICING	1D9
20	STANDARD PRACT - AIRFRAME	1E19
21	ENVIRONMENTAL SYSTEM	1F18
22	AUTOFLIGHT	1I6
23	COMMUNICATIONS	1I11
24	ELECTRICAL POWER	1J3
25	EQUIPMENT/FURNISHINGS	2A17
27	FLIGHT CONTROLS	2A24
28	FUEL	2D10
32	LANDING GEAR	2E16
33	LIGHTS	2G8
34	NAVIGATION & PITOT/STATIC	2H14

GAMA SYSTEM/CHAPTER INDEX GUIDE (CONTD)

SYST CHAP	SUB-SYST SECTIONTITLE	AEROFICHE GRID NO.
37	VACUUM SYSTEM	2I13
39	ELECTRIC/ELECTRONIC PANELS AND MULTI-PURPOSE PARTS	2J9
51	STRUCTURES	2J19
52	DOORS	2K18
55	STABILIZERS	2L7
56	WINDOWS	3A17
57	WINGS	3B3
61	PROPELLER	3B24
70	STANDARD PRACTICES - ENGINE	3C10
71	POWER PLANT	3C15
73	ENGINE FUEL SYSTEM	3D24
74	IGNITION	3E16
77	ENGINE INDICATING	3G7
78	EXHAUST	3G16
79	OIL SYSTEM	3G23
80	STARTING	3H10
91	CHARTS AND WIRING DIAGRAMS	3I4
91	CHARTS AND WIRING DIAGRAMS (CONT.)	4A17

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
6-1.	Three View - Archer II	1B20
6-2.	Three View - Archer III	1B21
6-3.	Station References - Archer II	1B22
6-4.	Station References - Archer III	1B24
6-5.	Access Plates and Panels	1B20
7-1.	Jacking Arrangement	1C7
8-1.	Leveling Longitudinally	1C11
8-2.	Leveling Laterally	1C11
8-3.	Weighing Airplane	1C12
11-1.	External Placards and Decals - Archer II	1C24
11-2	External Placards and Decals - Archer III	1D1
11-3	Internal Placards and Decals - Archer II	1D3
11-4	Internal Placards and Decals - Archer III	1D5
12-1.	Fuel Filter Bowl and Screen	1D14
12-2.	Servicing Points	1D19
12-3.	Main Gear Oleo Struts (cut-away view)	1D22
12-4.	Tire Balancer Fixture	1D24
12-5.	Lubrication Chart (Landing Gear, Main)	1E8
12-6.	Lubrication Chart (Landing Gear, Nose)	1E9
12-7.	Lubrication Chart (Control System)	1E10 thru 1E13
12-8.	Lubrication Chart (Cabin Door, Baggage Door and Seat)	1E14
12-9.	Lubrication Chart (Power Plant and Control Pivot Points)	1E15
12-10.	Lubrication Chart (Air Conditioning Condenser)	1E16
20-1.	Torque Wrench Formula	1E22
20-2.	Installing Rod End Bearings	1E23
20-3.	Cherrylock Rivet Removal	1E24
20-4.	Hose and Line Markings	1F1
20-5.	Flareless Tube Fittings	1F2
21-1.	Cabin Heater, Defroster, and Fresh Air System (Archer II)	1F23
21-2.	Overhead Vent System (not available with air conditioning) (Archer II)	1F24
21-3.	Cabin Heater, Defroster, and Fresh Air System (Archer III)	1G1
21-4.	Overhead Vent System (Archer III)	1G2
21-5.	Air Conditioning System Installation (Typical)	1G11
21-6.	Service Valves - Archer II (Sheet 1 of 2)	1G17
21-6.	Service Valves - Archer III (Sheet 2 of 2)	1G17
21-7.	Test Manifold and Charging Cart	1G18
21-8.	Manifold Set Operation	1G18
21-9.	Manifold to Recharging/Test Stand Hookup	1G19
21-10	Robinair 34700 Control Panel and Hose Connections	1G20
21-11	Robinair 34700 Hose Hookup	1G21
21-12	Compressor and Fabricated Oil Dipstick	1H6

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
21-13.	Compressor and Alternator Belt Installation (Sheet 1 of 2)	1H8
21-13.	Compressor and Alternator Belt Installation (Sheet 2 of 2)	1H9
21-14.	Magnetic Clutch	1H11
21-15.	Condenser Air Scoop Installation	1H14
21-16.	Expansion Valve	1H15
21-17.	Components Installation	1H17
21-18.	Air Conditioning Wiring Schematic (typical) - Archer II Sheet 1 of 2	1H19
21-18.	Air Conditioning Wiring Schematic (typical) - Archer III Sheet 2 of 2	1H20
23-1.	Two Year, Magnesium Battery Connections	1I15
23-2.	Communications Components Corporation ELT Schematic	1I16
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 1 of 2) (S/N's 28-7990457 thru 28-8690056 and 2890001 thru 2890065)	1I17
23-3.	Narco ELT 10 Emergency Locator Transmitter Schematic (Sheet 2 of 2) (S/N's 2890066 thru 2890139)	1I17
23-4.	ELT Portable Folding Antenna (Narco)	1I18
23-5.	ELT Using Fixed Aircraft Antenna (Narco)	1I18
23-6.	Narco ELT 910 Emergency Locator Transmitter Schematic	1I20
23-7.	ELT 910 Battery Pack	1I21
23-8	Artex 110 E. L. T.	1I22
23-9	Artex E. L. T. 110 Wiring Schematic	1I23
24-1.	Exploded View of Prestolite Alternator	1J16
24-2.	Lamp-Bank Load	1J16
24-3.	Removal of Slip Ring End Bearing (Prestolite Alternator)	1J20
24-4.	Removal of Rectifier (Prestolite Alternator)	1J20
24-5.	Removal of Drive End Head (Prestolite Alternator)	1J20
24-6.	Removal of End Head Bearing (Prestolite Alternator)	1J20
24-7.	Testing Rotor for Ground (Prestolite Alternator)	1J22
24-8.	Testing Rotor for Shorts (Prestolite Alternator)	1J22
24-9.	Installation of Bearing (Prestolite Alternator)	1J22
24-10.	Installation of Rectifier (Prestolite Alternator)	1J22
24-11.	Terminal Assembly (Prestolite Alternator)	1J24
24-12.	Slip Ring End Bearing Assembly (Prestolite Alternator)	1J24
24-13.	Testing Prestolite Alternator	1J24
24-14.	Prestolite Brush Installation	1J24
24-15.	Prestolite Alternator Internal Wiring Diagram	1K2
24-16.	Exploded View of Chrysler Alternator	1K3

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-17.	Checking Chrysler Alternator Field Coil Current Draw	1K5
24-18.	Testing Chrysler Alternator Field Circuit	1K6
24-19.	Chrysler Alternator Rectifier End Shield and Stator Assembly	1K7
24-20.	Testing Chrysler Alternator Positive Rectifiers with C3829 Tester	1K8
24-21.	Testing Chrysler Alternator Negative Rectifiers with C-3829 Tester	1K8
24-22.	Testing Chrysler Alternator Positive Rectifiers with Test Lamp	1K9
24-23.	Testing Chrysler Alternator Negative Rectifiers with Test Lamp	1K9
24-24.	Chrysler Alternator Rectifier and Heatsink Assembly Removal	1K10
24-25.	Chrysler Alternator Rectifier End Shield Assembly	1K10
24-26.	Testing Chrysler Alternator Stator	1K11
24-27.	Removal of Chrysler Alternator Pulley	1K11
24-28.	Removal of Chrysler Alternator Bearing	1K11
24-29.	Removal of Chrysler Alternator Rectifier End Shield Bearing	1K11
24-30.	Testing Chrysler Alternator Rotor for Ground	1K12
24-31.	Testing Chrysler Alternator Rotor for Opens or Shorts	1K12
24-32.	Installation of Chrysler Alternator Grease Retainer	1K13
24-33.	Installation of Chrysler Alternator Rectifier End Shield Bearing	1K13
24-34.	Installation of Chrysler Alternator Drive End Shield Bearing	1K14
24-35.	Installation of Chrysler Alternator Pulley	1K14
24-36.	Installation of Chrysler Alternator Insulators	1K14
24-37.	Installation of Chrysler Alternator Positive Rectifier Assembly	1K14
24-38.	Installation of Chrysler Alternator Capacitor	1JK5
24-39.	Installation of Chrysler Alternator Battery Output Insulator	1K15
24-40.	Installation of Chrysler Alternator Negative Rectifier Assembly	1K16
24-41.	Installation of Chrysler Alternator Stator	1K16
24-42	Exploded View of Electrosystems Alternator	1K18
24-43	Eight Resistor-Bank Load	1K19
24-44.	Removal of Slip Ring End Bearing (Electrosystems Alternator)	1K21
24-45.	Removal of Rectifier (Electrosystems Alternator)	1K21
24-46.	Removal of Drive End Head (Electrosystems Alternator)	1K22
24-47.	Removal of End Head Bearing (Electrosystems Alternator)	1K22

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
24-48.	Testing Rotor for Ground (Electrosystems Alternator)	1K23
24-49.	Testing Rotor for Shorts (Electrosystems Alternator)	1K23
24-50.	Installation of Bearing (Electrosystems Alternator)	1K23
24-51.	Installation of Rectifier (Electrosystems Alternator)	1K23
24-52.	Terminal Assembly (Electrosystems Alternator)	1L1
24-53.	Slip Ring End Bearing Assembly (Electrosystems Alternator)	1L1
24-54.	Testing Electrosystems Alternator	1L1
24-55.	Electrosystems Alternator Brush Installation	1L2
24-56.	Electrosystems Alternator Internal Wiring Diagram	1L3
24-57.	Lamar Regulator Check	1L15
24-58.	Lamar Overvoltage Check	1L15
25-1.	Seat Back Lock	2A19
25-2.	Lunbar Seat Bladder Installation	2A21
27-1.	Rod End Installation Method	2B5
27-2.	Control Cable Inspection Technique	2B5
27-3.	Cable Wear Patterns	2B6
27-4.	Internal Cable Wear	2B7
27-5.	Pulley Wear Patterns	2B9
27-6.	Control Column Assembly	2B13
27-7.	Flex (Universal) Joint Assembly	2B15
27-8.	Aileron Controls (typical)	2B17
27-9.	Aileron Rigging Tool	2B20
27-10.	Fabricated Aileron and Flap Rigging Tool	2B20
27-11.	Bellcrank Rigging Tool	2B22
27-12.	Aileron Rigging	2B23
27-13.	Rudder and Steering Pedal Assembly	2C3
27-14.	Rudder Controls	2C5
27-15.	Rudder Rigging Tool	2C7
27-16.	Clamping Rudder Pedals	2C7
27-17.	Rudder Rigging	2C8
27-18.	Fabricated Rudder Rigging Tool	2C8
27-19.	Rudder Travel Adjustments	2C9
27-20.	Rudder Trim Control	2C10
27-21.	Stabilator Controls	2C16
27-22.	Stabilator Rigging Tool	2C17
27-23.	Fabricated Stabilator Rigging Tool	2C18
27-24.	Stabilator and Trim Travel Adjustments	2C18
27-25.	Stabilator Trim Control (Floor Control)	2C20
27-26.	Methods of Securing Trim Cables	2C21
27-27.	Flap Controls	2D3
27-28.	Flap Stop Adjustment	2D5
27-29.	Flap Rigging Tool	2D5
27-30.	Flap Rigging	2D7

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
28-1.	Archer II Fuel System Diagram	2D14
28-2.	Archer III Fuel System Diagram (S/N's 2890006 and up)	2D15
28-3.	Locking Gas Cap	2D20
28-4.	Fuel Filter Bowl and Screen	2D23
28-5.	Plunger Fuel Pump	2D24
28-6.	Tolerances, Union Nut,and Tubing Nut	2E3
28-7.	Resistance Decade Test Box Set Up	2E9
28-8	Archer III Fuel Quantity Needle Deviation	2E10
28-9.	Fuel Quantity Transmitter Checking Jig	2E12
28-10	Fabricated Fuel Quantity Transmitter Checking Jig	2E13
32-1.	Main Gear Oleo Strut Assembly	2F1
32-2.	Orifice Replacement Tool	2F2
32-3.	Main Gear Installation	2F4
32-4.	Nose Gear Oleo Strut Assembly	2F8
32-5.	Retainer Ring Tool	2F10
32-6.	Nose Gear Installation	2F11
32-7.	Clamping Rudder Pedals in Neutral Position	2F14
32-8	Rudder Pedals at Neutral Angle	2F14
32-9.	Main Wheel Assembly	2F16
32-10.	Nose Wheel Assembly	2F18
32-11.	Brake Assembly	2F19
32-12.	Removal and Installation of Anchor Bolts	2F20
32-13.	Disc Brake Minimum Thickness	2F22
32-14.	Brake System Installations	2F22
32-15.	Brake Master Cylinder (Hand/Parking Brake)	2F23
32-16.	Toe Brake Installation	2G1
32-17.	Brake Cylinder 10-27, 10-30, and 17000 (Toe Brake)	2G2
33-1.	Archer II Annunciator Panel	2G21
33-2.	Archer III Annunciator Panel and Box Assembly	2G22
33-3	Archer II Strobe Light Connections	2H3
33-4	Archer III Landing Light Installation	2H6
33-5	Archer III Landing Light Adjustment	2H7
33-6	Archer III Strobe Light Connections	2H10
34-1.	Pitot/Static System	2H19
37-1.	Archer II Auxiliary Vacuum Pump Installation	2J1
37-2	Archer III Auxiliary Vacuum Pump Installation	2J2
37-3	Archer II and III Auxiliary Vacuum Electrical Schematic	2J3
51-1.	Skin Materials and Thickness	2K2
51-2	Baggage Compartment Inspection Holes Cutout Details	2K4
51-3.	Surface Scratches, Abrasions, or Ground-in-Dirt	2K8
51-4.	Deep Scratches, Shallow Nicks, and Small Holes	2K9
51-5.	Mixing of Epoxy Patching Compound	2K9
51-6.	Welding Repair Method	2K11
51-7.	Repairing of Cracks	2K11

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
51-8.	Various Repairs	2K12
51-9.	Repair of Stress Lines	2K13
51-10.	Repair of Impacted Damage	2K13
52-1.	Installation of Door Snubber	2L1
52-2.	Fabricated Tool for Baggage Door Lock	2L5
55-1.	Empennage Group Installation	2L12
55-2.	Methods of Securing Control Cables	2L13
55-3.	Stabilator Balance	2L13
55-4.	Control Surface Balancing Tool	2L14
55-5.	Rudder Balance	2L20
56-1.	Windshield Installation - Typical	3A22
56-2.	Single Pane Side Window Installation, - Typical	3A24
57-1.	Installation of Stall Stips	3B8
57-2.	Wing Installation	3B11
57-3.	Aileron and Flap Installation	3B19
57-4.	Aileron Balance Configuration	3B21
61-1.	Typical Nicks and Removal Method	3C4
61-2.	Archer II Propeller Installation	3C6
61-3.	Archer III Propeller Installation	3C7
71-1.	Static Rpm (Sea Level ± 500 Feet Pressure Alltitude Only)	3D4
71-2.	Change in Static Rpm Vs. Engine Oil Temperature	3D5
71-3.	Psychromatic Chart	3D6
71-4.	Archer II Engine Installation	3D9
71-5.	Archer III Engine Installation	3D10
71-6.	Archer II Cowling	3D15
71-7.	Archer III Cowling (S/N’s 2890206 and up)	3D15
71-8.	Ice Detection System	3D22
73-1.	Carburetor	3E5
73-2.	Archer II Engine Primer	3E6
74-3.	Archer III Fuel Primer System	3E7
73-4.	Adjustment of Engine Controls	3E10
73-5	Archer III Instrument Cluster - Fuel Pressure Gauge	3E14
74-1.	T-100 Assembly and Timing Tool Kit	3E23
74-2.	Removing Coil Wedges	3F2
74-3.	Exploded View of 4200 Series Magneto	3F3
74-4.	Index Plate and Timing Plug	3F5
74-5.	Installation of Bearings and Bearing Plate	3F5
74-6.	Magneto Oil Seal Installation on T-100	3F7
74-7.	Magneto Internal Timing	3F7
74-8.	Bendix Magneto Inspection	3F9
74-9.	Contact Spring Inspection	3F10
74-10.	Impulse Coupling	3F10
74-11.	Magneto Timing Marks	3F12
74-12.	Timing Pointer	3F12

LIST OF ILLUSTRATIONS (continued)

FIGURE NO.	SUBJECT	GRID NO.
74-13.	Timing Kit Installed	3F12
74-14.	Breaker Compartment With Cast Timing Marks	3F12
74-15.	Stripping Tool	3F18
74-16.	Inserting Stripping Tool	3F18
74-17.	Cutting Insulation	3F18
74-18.	Removing Silicone Rubber From Wire	3F18
74-19.	Installation of Plug Endnut	3F19
74-20.	Flaring Out the Shielding	3F19
74-21.	Installation of Ferrule	3F19
74-22.	Driving Tool	3F19
74-23.	Installation in Housing	3F21
74-24.	Securing Wire in Housing	3F21
74-25.	Installation of Electrical Screw	3F21
74-26.	Installation of Insulation Sleeve	3F21
74-27.	Installation of Spring	3F22
74-28.	Removing Spark Plug Frozen to Bushing	3F22
74-29.	Archer II Ignition Switch Installation	3G2
74-30.	Archer III Starter Switch Installation	3G2
74-31.	Archer III Magneto Switch(es) Installation	3G3
77-1.	Exhaust Gas Temperature Probe Installation	3G14
78-1.	Archer II Exhaust System Inspection Points	3G20
78-2	Archer III Exhaust System Inspection Points	3G20
80-1.	Exploded View of Gear Reduction Starting Motor	3H14
80-2.	Turning Starting Motor Commutator	3H19
80-3.	Testing Motor Armature for Shorts	3H19
80-4.	Testing Motor Fields for Grounds	3H20
80-5.	No-Load Test Hookup	3H22
80-6.	Stall-Torque Hookup	3H22

Refer to Electrical Schematic Table of Contents 4A18

LIST OF CHARTS

FIGURE NO.	SUBJECT	GRID NO.
601	Leading Particulars and Principal Dimensions	1B18
1201	Thread Lubricants	1E5
1202	Type of Lubricants	1E6
2001	Maximum Distance Between Supports for Fluid Tubing	1F3
2002	Types of Metal Corrosion	1F9
2101	Troubleshooting Air Conditioner	1G5
2102	Troubleshooting Air Conditioning System	1G7
2103	Refrigerant Temperature Pressure	1G13
2104	Aluminum Tubing Torque (Archer II)	1G16
2105	Recommended Torque Specifications (Archer III)	1G16
2106	System Vacuum	1G19
2107	Compressor Oil Charge	1H7
2108	Compressor Misalignment and Idler Pulley Nominal Location	1H7
2109	Blower System Wire Color Codes	1I3
2401	Troubleshooting Alternator	1J9
2402	Troubleshooting (Battery)	1J13
2403	Prestolite Alternator Specifications	1K1
2404	Chrysler Alternator Specifications	1K17
2405	Electrosystems Alternator Specifications	1L3
2406	Alternator Belt Tension	1L4
2407	Hydrometer Reading and Battery Charge Percent Archer II, 12 Volt System	1L6
2408	Hydrometer Reading and Battery Charge Percent Archer III, 24 Volt System	1L10
2409	Electrolytic Temperature Corrections	1L10
2410	Specific Gravity Temperature Correction	1L11
2411	Discharge Rate	1L11
2412	Electrolyte Freezing Point	1L12
2413	(Archer II) Electrical System Component Loads	1L22
2414	(Archer III) Electrical System Component Loads	1L23
2701	Cable Tension Vs. Ambient Temperature	2B4
2702	Troubleshooting Aileron Control System	2B11
2703	Troubleshooting Rudder Control System	2C1
2704	Troubleshooting Rudder Trim Control System	2C2
2705	Troubleshooting Stabilator Control System	2C13
2706	Troubleshooting Stabilator Manual TrimControl	2C14
2707	Troubleshooting Flap Control System	2D2
2801	Troubleshooting (Fuel System)	2D16
2802	Transmitter/Fuel Gauge Tolerances	2E7
2803	Fuel Quantity Gauge Resistance/Tolerances Values	2E7
2804	14 Vdc Fuel Quantity Gauge Tolerance Values	2E8
2805	28 Vdc Fuel Quantity Gauge Resistance/Tolerance Values	2E9
2806	28 Vdc Fuel Quantity Gauge Tolerance Values	2E10
2807	Fuel Quantitiy Transmitter Calibration Tolerances	2E11
2808	Troubleshooting Fuel Quantity Indicator	2E14
3201	Troubleshooting (Landing Gear)	2E20

LIST OF ILLUSTRATIONS

FIGURE NO.	SUBJECT	GRID NO.
3202	Nose Gear Alignment Tolerances	2F13
3301	Archer III Annunciator Panel Function Description	2G15
3302	Troubleshooting Archer II Annunciator Panel	2G16
3303	Troubleshooting Archer III Annunciator Panel	2G18
3401	Troubleshooting Vertical Speed Indicator	2H21
3402	Troubleshooting Altimeter	2H22
3403	Troubleshooting Pitot/Static Tubes and Airspeed Indicator)	2H23
3404	Troubleshooting Attitude Deviation Indicator	2I4
3405	Troubleshooting Heading (Dirctional Gyro) Indicator	2I7
3406	Troubleshooting (Magnetic Compass)	2I8
3407	Troubleshooting Turn Indicator	2I10
3701	Troubleshooting Vacuum System	2I16
5101	List of Materials For Thermoplastic Repair	2K7
6101	Archer II Propeller Torque Limits	3C5
7101	Engine Fault Isolation	3C19
7102	Peopeller Applicability	3D2
7103	Static Rpm With 76EM8S5-0-62 or 76EM8S14-0-62 Propellers	3D7
7301	Troubleshooting Fuel Pressure Gauge	3E12
7302	Archer III Instrument Calibration Chart	3E13
7401	Troubleshooting Archer II Magnetos	3E19
7701	Troubleshooting (Tachometer)	3G11
7702	Troubleshooting (Exhaust Gas Temperature Gauge) (Alcor)	3C24
7901	Troubleshooting Archer II Engine Oil Pressure Gauge	3H6
7902	Troubleshooting Archer II Engine Oil Temperature Gauge	3H6
7903	Troubleshooting Archer III Engine Oil Pressure Gauge	3H7
7904	Troubleshooting Archer IIi Engine Oil Temperature Gauge	3H8
8001	Troubleshooting (Starter)	3H14
8002	Starting Motor Specifications	3H23
9101	Flare Fitting Torques	3I7
9102	Recommended Nut Torques	3I8
9103	Decimal Conversions	3I10
9104	Torque Conversion Tables	3I11
9105	Conversion Table Notes	3I12
9106	Metric Conversion Tables	3I13
9107	Decimal/Millimeters Equivalents of Drill Sizes	3I6
9108	Ball Diameters For Testing Hose Restrictions	3I8
9109	Hose Specitfications	3I9
9110	List of Consumable Materials	3I20
9111	Vender Information	3J4
9112	Electrical Wire Coding	3J7
9113	Electrical Symbols	3J8

CHAPTER

91

CHARTS AND WIRING DIAGRAMS (CONTINUED)

4A17

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
	CHARTS		
	Refer to Card 3 For All Charts		
	WIRING DIAGRAMS		
91-20-00	**ANNUNCIATOR SYSTEMS**		
91-20-01	S/N's 28-7690001 thru 28-7690467	4B1	91-1
91-20-02	S/N's 28-7790001 thru 28-8690056 and 2890001 thru 2890205	4B2	91-2
	Archer III		
91-20-03	Annunciators (S/N's 2890206 and up)	4B3	91-3 (Sheet 1 of 3)
91-20-03	Annunciator Lights (S/N's 2890206 and up)	4B4	91-3 (Sheet 2 of 3)
91-20-03	Annunciator Box Assembly (S/N's 2890206 and up)	4B5	91-3 (Sheet 3 of 3)
91-22-00	**COMFORT SYSTEMS**		
	Cigar Lighter		
91-22-01	S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205	4B8	91-4
91-22-01	S/N's 2890206 and up	4B8	91-5
91-24-00	**DEICE SYSTEMS**		
	Pitot Heat	—	—
91-24-01	S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205	4B9	91-6
91-24-01	S/N's 2890206 and up	4B9	91-7
91-26-00	**ELECTRICAL SYSTEMS**		
	Alternator System / External Power		
91-26-01	S/N's 28-769000l to 28-8l90318	4B11	91-8
91-26-01	S/N's 28-829000l to 28-8290l78	4B12	91-9
91-26-01	S/N's 28-839000l thru 28-8690056 and 2890001 thru 2890205	4B13	91-10
	Alternator System		
91-26-02	S/N's 2890206 and up	4B14	91-11

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
91-26-00	**ELECTRICAL SYSTEMS (Continued)**		
	Avionics Master		
91-26-03	S/N's 28-8090001 thru 28-82900178 (Optional)	4B17	91-12 (Sheet 1 of 3)
91-26-03	S/N's 28-8390001 thru 28-8690056 and 2890001 thru 2890205 (Optional)	4B17	91-12 (Sheet 2 of 3)
91-26-03	S/N's 2890206 and up	4B17	91-12 (Sheet 3 of 3)
91-28-00	**ENGINE SYSTEMS**	—	—
	Starter	—	—
91-28-01	S/Ns S/N's 28-7690001 to 28-8190318	4B18	91-13 (Sheet 1 of 2)
91-28-01	S/N's 28-8290001 thru 28-8690056 and 2890001 thru 2890205	4B19	91-13 (Sheet 1 of 3)
	Starter / External Power	—	—
91-28-02	S/N's 2890206 and up	4B20	91-14
	Magnetos	—	—
91-28-03	S/N's 2890206 and up	4B21	91-15
91-30-00	**ENVIRONMENTAL SYSTEMS**	—	—
91-30-01	Air Conditioning (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4B24	91-16
91-30-01	Air Conditioning (S/N's 2890206 and up)		
91-30-02	Air Conditioner / Air Blower (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C1 4C2	91-17 91-18
91-30-03	Fresh Air Blower (S/N's 2890206 and up)	4C2	91-19
91-31-00	**FLIGHT CONTROLS**	—	—
91-31-01	Stall Warning (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C3	91-20 (Sheet 1 of 2)
91-31-01	Stall Warning (S/N's 2890206 and up)	4C3	91-20 (Sheet 2 of 2)

Island Enterprises

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
91-32-00	**FUEL SYSTEM**	—	—
91-32-01	Electric Fuel Pump (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C5	91-21
91-32-02	Electric Fuel Pump and Engine Primer (S/N's 2890206 and up)	4C5	91-22
91-26-00 and 91-34-00	**INDICATORS**	—	—
	Ammeter	—	—
91-26-01	S/N's 28-7690001 to 28-8190318. (**See Figure 91-8**)	4B11	91-8
91-26-01	S/N's 28-8290001 to 28-8290178. (**See Figure 91-9**)	4B12	91-9
91-26-01	S/N's 28-8390001 thru 28-8690056 and 2890001 thru 2890205. (**See Figure 91-10**)	4B13	91-10
91-26-03	S/N's 2890206 and up. (**See Figure 91-11**)	4B14	91-11
91-34-00	**INDICATORS (Continued)**		
91-34-03	**Engine ((S/N's 28-7690001hru 28-8690056 and 2890001 thru 2890205)**	—	—
91-34-03	Gauges and Senders (S/N's 28-7690001 to 28-7990487)	4C7	91-23 (Sheet 1 of 2)
91-34-03	Gauges and Senders (S/N'S 28-7990488 thru 28-8690056 and 2890001 thru 2890205)	4C7	91-23 (Sheet2 of 2)
91-34-04	**Engine (S/N's 2890206 and up)**		
91-34-04	Temperature and Pressure (S/N's 2890206 and up)	4C8	91-24
91-34-04	Fuel Gauges (S/N's 2890206 and up)	4C8	91-25
	Clocks and Hourmeter Installation	—	—
91-34-05	Optional Clock and Hour Meter Installation (S/N's 28-8190001 thru 28-8290069)	4C9	91-26 (Sheet 1 of 2)

Island Enterprises

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
	Clocks and Hourmeter Installation (Continued)		—
91-34-05	Optional Clock and Hour Meter Installation with Narco Power Circuitry (S/N's 28-8290070 thru 28-8690056 and 2890001 thru 2890205)	4C9	91-26 (Sheet 2 of 2)
91-34-05	Clock (Optional) and Hour Meter Installation (S/N's 28900206 and up)	4C10	91-27
	Turn Indicators	—	—
91-34-06	Turn and Slip Indicator and Optional Unit with Lighted Face (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C11	91-28
91-34-07	Turn Coordinator (S/N's 28900206 and up)	4C11	91-29
91-36-00	**LIGHTING - EXTERIOR**	—	—
91-36-01	Anti-Collision Beacon (S/N's 28-7690001 thru 28-7990220	4C13	91-30
91-36-02	Anti-Collision Wing Strobes and Beacon S/N's 28-7690001 thru 28-7990220	4C13	91-31 (Sheet 1 of 2)
	S/N's 28-7990221 thru 28-8690056 and 2890001 thru 2890205	4C13	91-31 (Sheet 2 of 2)
91-36-03	Anti-Collision Wing Strobes S/N's 28-7690001 thru 28-7990220	4C13	91-32 (Sheet 1 of 2)
	S/N's 28-7990221 thru 28-8690056 and 2890001 thru 2890205	4C14	91-32 (Sheet 2 of 2)
91-36-04	Anti-Collision Fin Strobe (S/N's 28-7990221 thru 28-8190109)	4C14	91-33
91-36-05	Anti-Collision Wing and Fin Strobe (S/N's 28-7990221 thru 28-8190109)	4C14	91-34
91-36-06	Landing (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C14	91-35 (Sheet 1 of 2)

Island Enterprises

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
91-36-00	**LIGHTING - EXTERIOR (Continued)**	—	—
	Landing (S/N's 28900206 and up)	4C15	91-35 (Sheet 2 of 2)
91-36-07	Optional Recognition Lights (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C16	91-36
91-36-08	Navigation (Position) Lights (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C16	91-37
91-36-09	Navigation and Anti-Collision Lights (S/N's 28900206 and up)	4C17	91-38
91-38-00	**LIGHTING - INTERNAL**	—	—
	Cabin Lighting	—	—
91-38-01	Cabin Lights (S/N's 28-7690001 thru 28-8090372)	4C20	91-39
91-38-02	Cabin and Ovehead Flood Lighting (S/N's 28-8190001 thru 28-8690056 and 2890001 thru 2890205	4C21	91-40
91-38-03	Dimmer Control Wiring (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4C22	91-41
91-38-04	Dome Reading Lights (S/N's 28900206 and up)	4C22	91-42
91-38-05	Overhead Flood and ELT (S/N's 28-7790001 thru 28-8090372)	4C23	91-43
91-38-02	Overhead Flood (S/N's 28-8190001 thru 28-8690056 and 2890001 thru 2890205) **(See Figure 91-40)**	4C21	91-40
91-38 06	Overhead Flood Lights (S/N's 28900206 and up)	4C23	91-44
91-38-07	Panel Lighting and Navigation Lighting (S/N's 28-7690001 thru 28-8190318)	4C24	91-45
91-38-08	Panel and Navigation Lighting (S/N's 28-8290001 thru 28-8690056 and 2890001 thru 2890205)	4D1	91-46
91-38-09	Panel Instrument Lighting (S/N's 28900206 and up)	4D2	91-47

Island Enterprises

CHAPTER 91 -CHARTS AND WIRING DIAGRAMS - Cont.

TABLE OF CONTENTS/EFFECTIVITY

CHAPTER SECTION	SUBJECT	GRID NO.	FIGURE NO.
91-38-00	**LIGHTING - INTERNAL (Continued)**		
91-38-10	Radio Lights and Dimmer (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)	4D3	91-48 (Sheet 1 of 2)
	Radio Lights (S/N's 28900206 and up)	4D3	91-48 (Sheet 2 of 2)
91-38-11	Switch Lighting (S/N's 28900206 and up)	4D4	91-49

Island Enterprises

THIS PAGE INTENTIONALLY LEFT BLANK

Island Enterprises

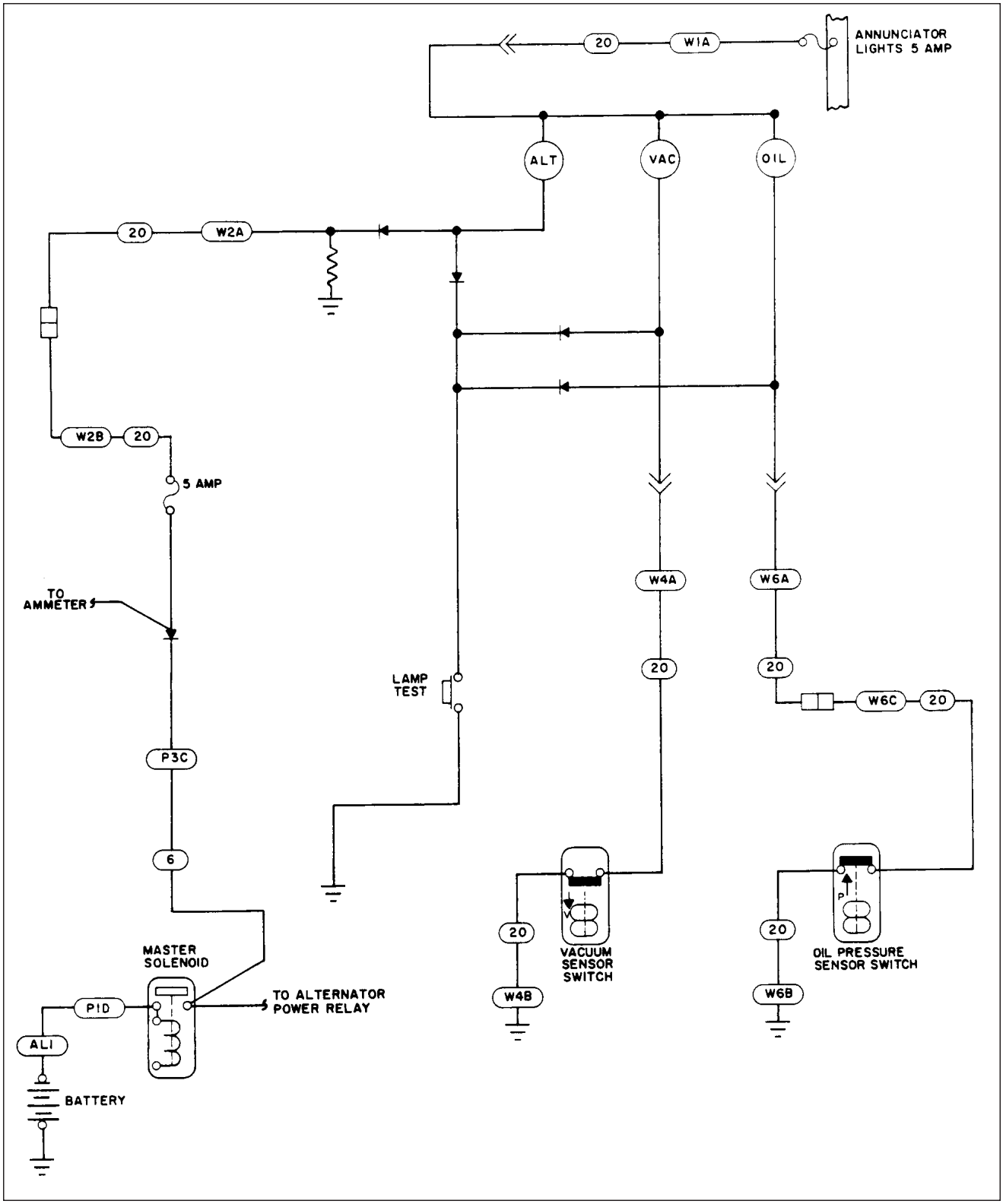


Figure 91-1. Annunciator (S/N's 28-7690001 thru 28-7690467)

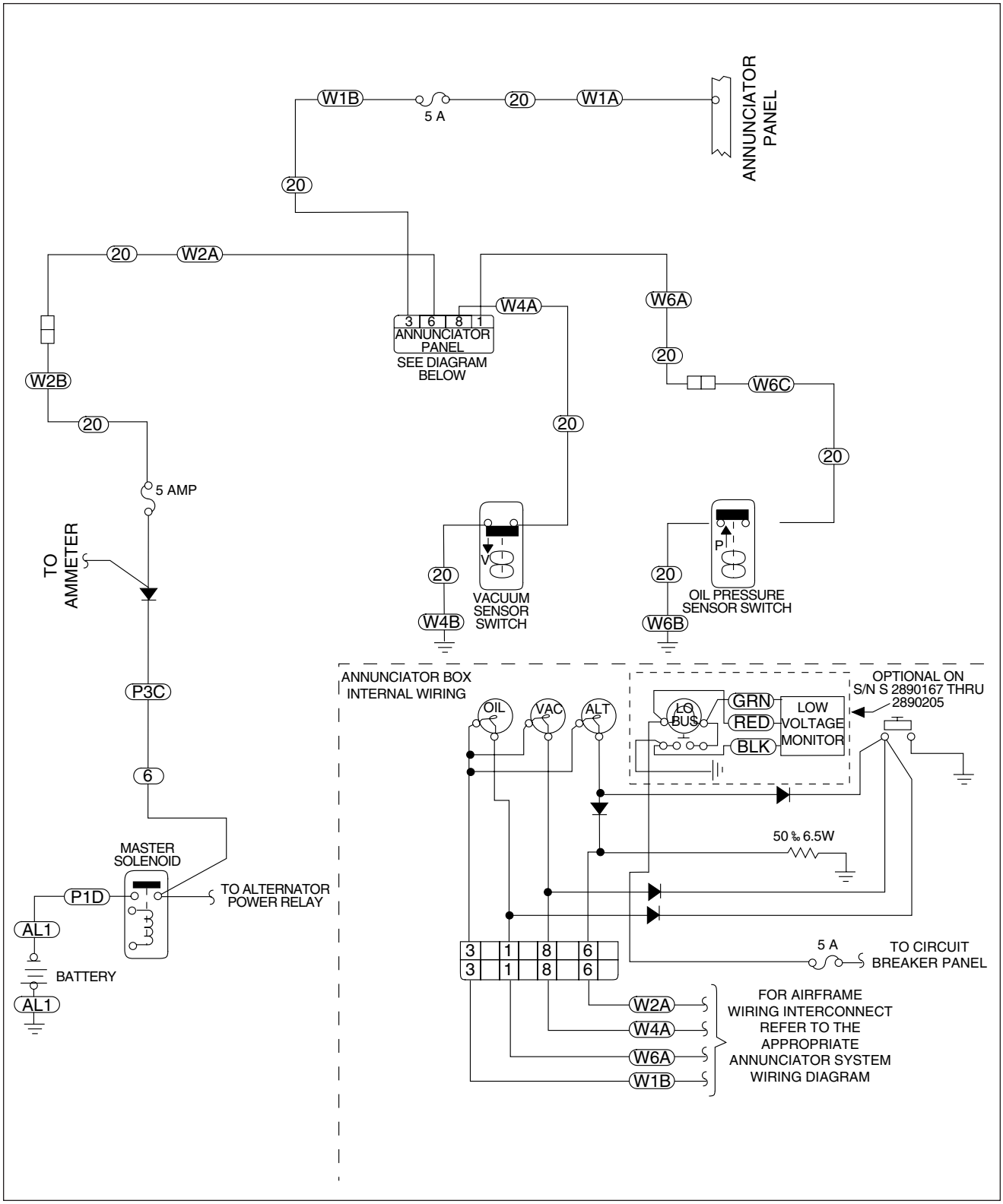


Figure 91-2. Annunciator (S/N's 28-7790001 thru 28-8690056 and 2890001 thru 2890205)

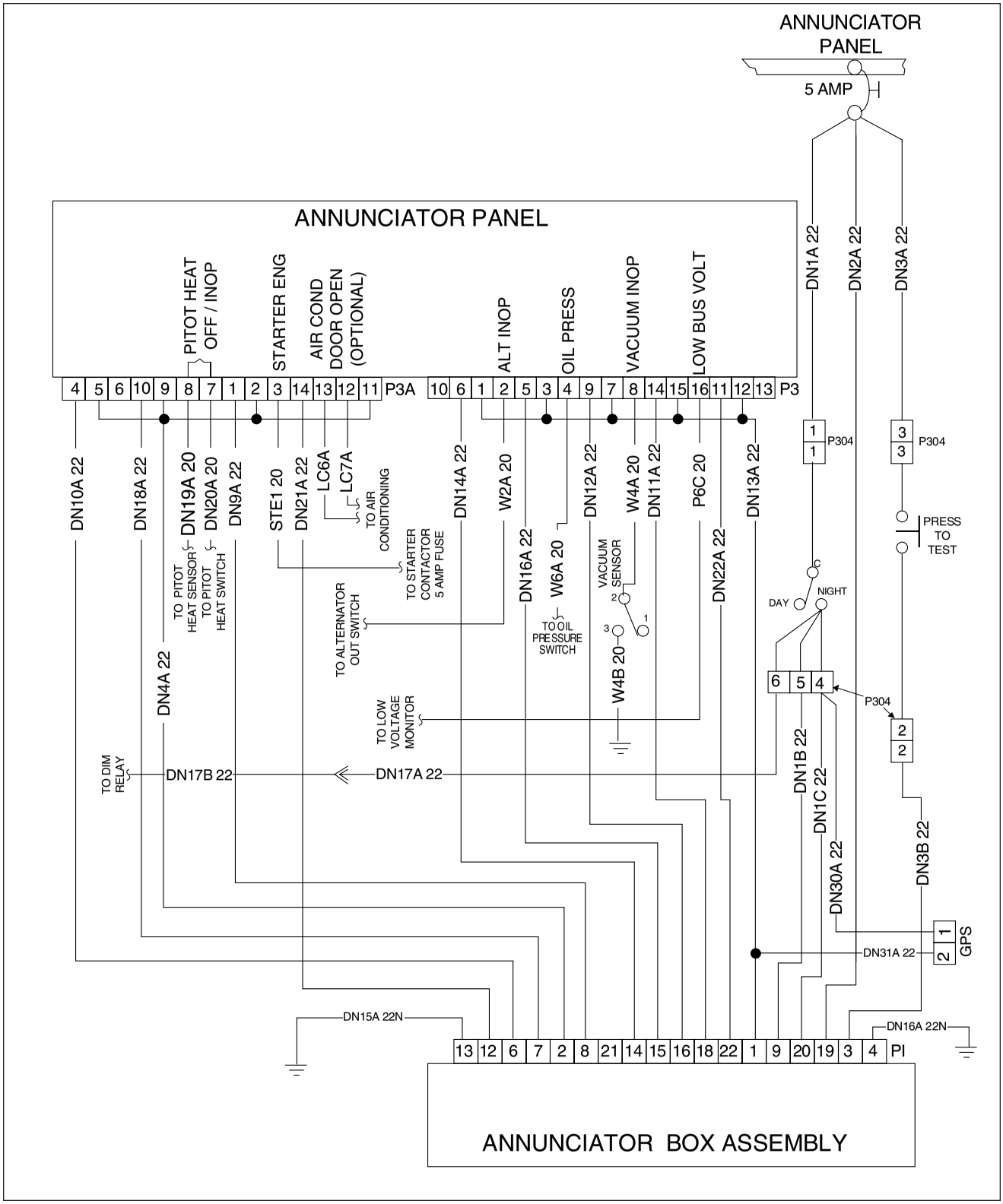


Figure 91-3. Annunciator (S/N's 2890206 and up)
(Sheet 1 of 3)

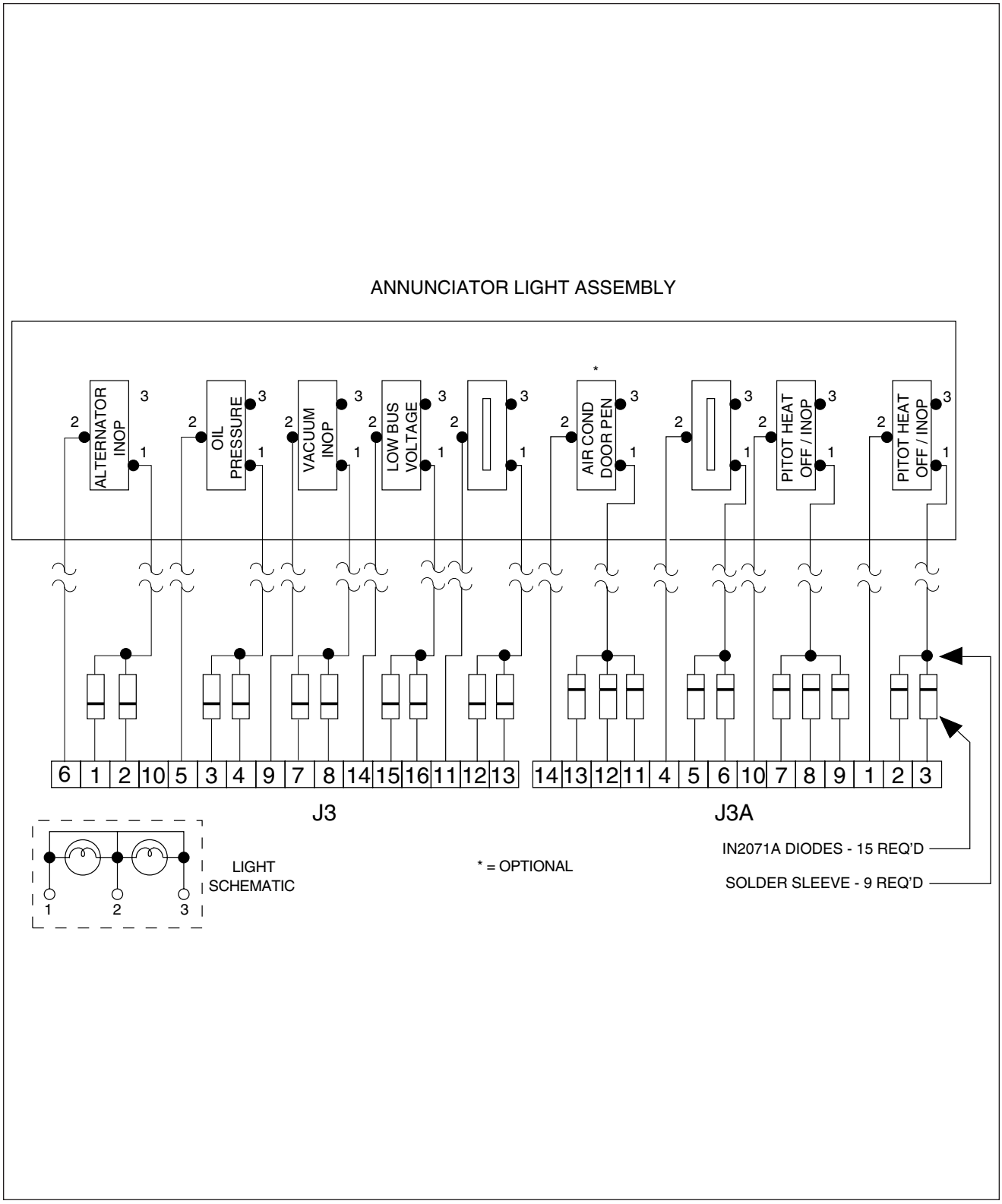

ANNUNCIATOR LIGHT ASSEMBLY
ALTERNATOR INOP
OIL PRESSURE
VACUUM INOP
LOW BUS VOLTAGE
AIR COND DOOR PEN
PITOT HEAT OFF / INOP
PITOT HEAT OFF / INOP
6 1 2 10 5 3 4 9 7 8 14 15 16 11 12 13
14 13 12 11 4 5 6 10 7 8 9 1 2 3
J3
J3A
LIGHT SCHEMATIC
1 2 3
* = OPTIONAL
IN2071A DIODES - 15 REQ'D
SOLDER SLEEVE - 9 REQ'D

Figure 91-3. Annunciator (S/N's 2890206 and up)
(Sheet 2 of 3)

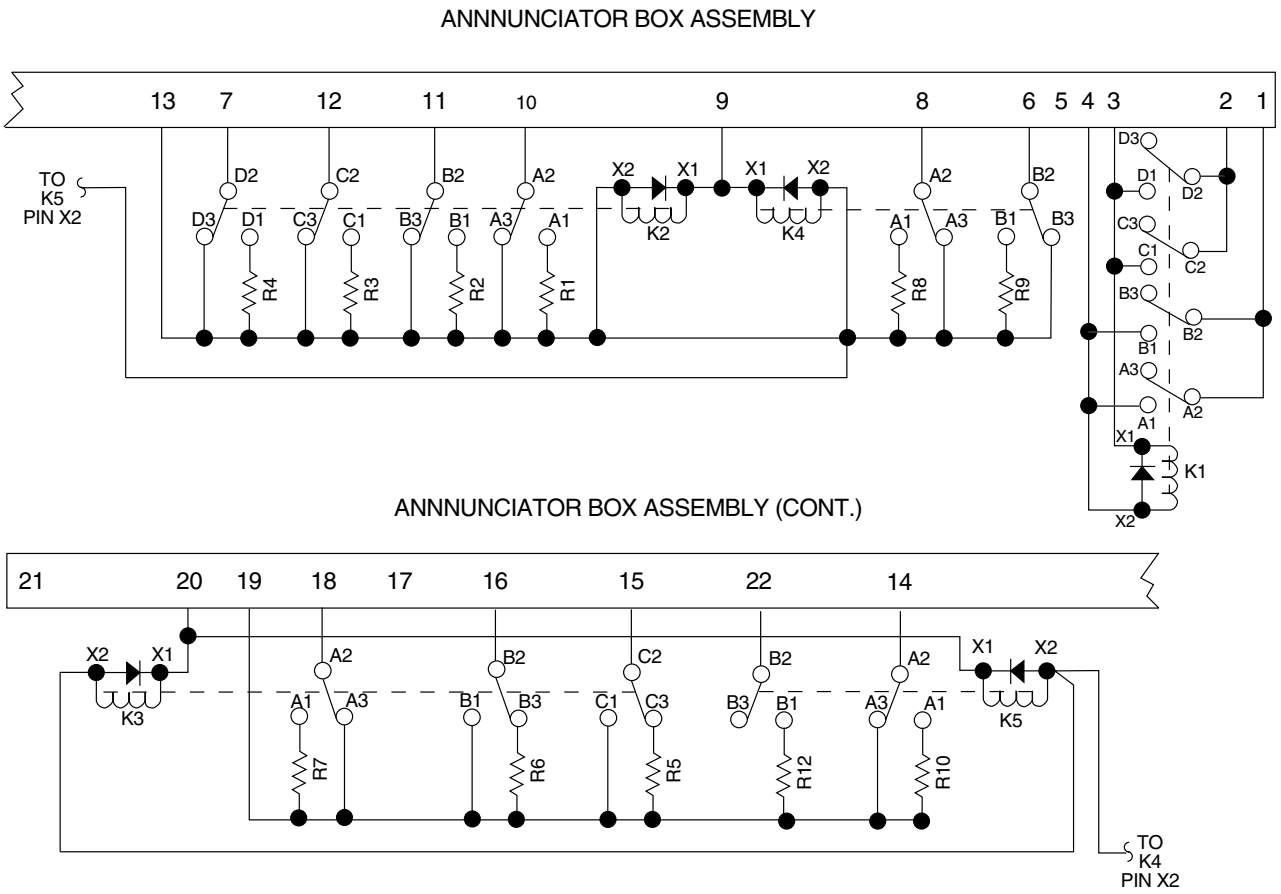

ANNNUNCIATOR BOX ASSEMBLY
13 7 12 11 10 9 8 6 5 4 3 2 1
TO K5 PIN X2
D2 C2 B2 A2 X2 X1 X1 X2 A2 B2
D3 D1 C3 C1 B3 B1 A3 A1
R4 R3 R2 R1 K2 K4 R8 R9
D3 D1 D2 C3 C1 C2 B3 B1 B2 A3 A1 A2 X1 K1 X2
ANNNUNCIATOR BOX ASSEMBLY (CONT.)
21 20 19 18 17 16 15 22 14
X2 X1 A2 B2 C2 B2 A2 X1 X2
K3 A1 A3 B1 B3 C1 C3 B3 B1 A3 A1 K5
R7 R6 R5 R12 R10
TO K4 PIN X2

Figure 91-3. Annunciator (S/N's 2890206 and up)
(Sheet 3 of 3)

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

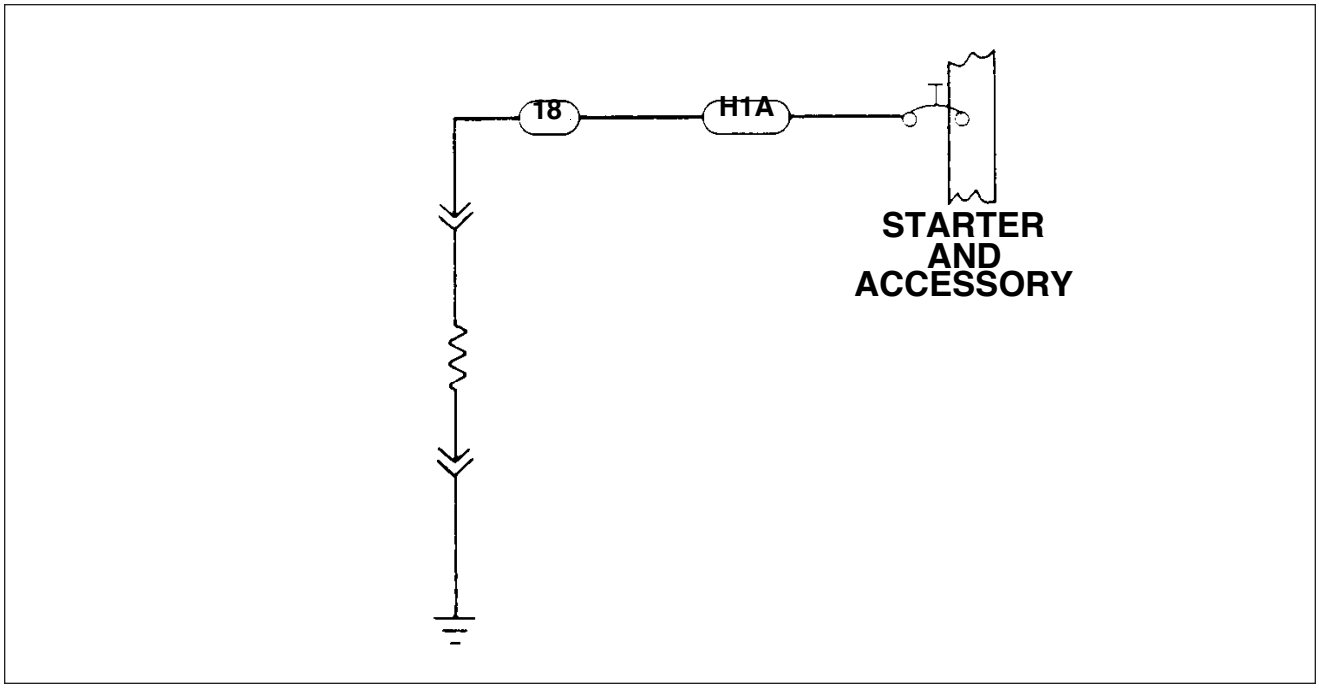


Figure 91-4. Cigar Lighter (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)

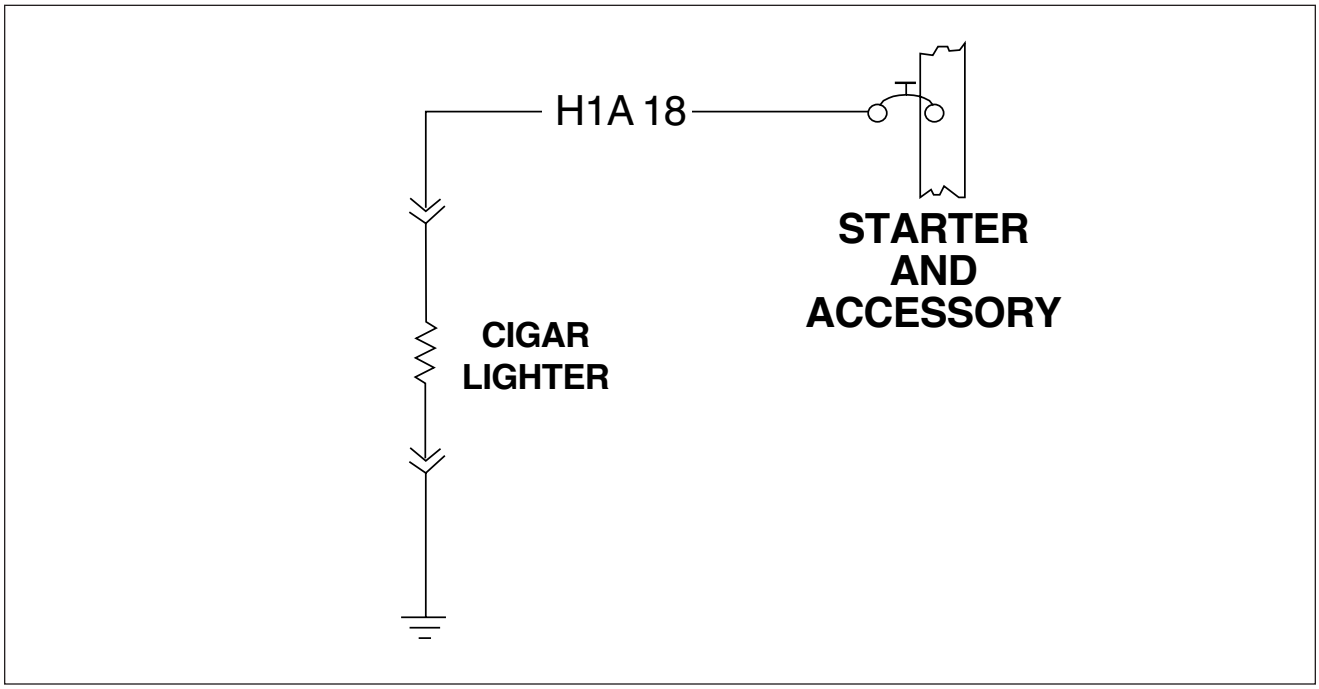


Figure 91-5. Cigar Lighter (S/N's 2890206 and up)

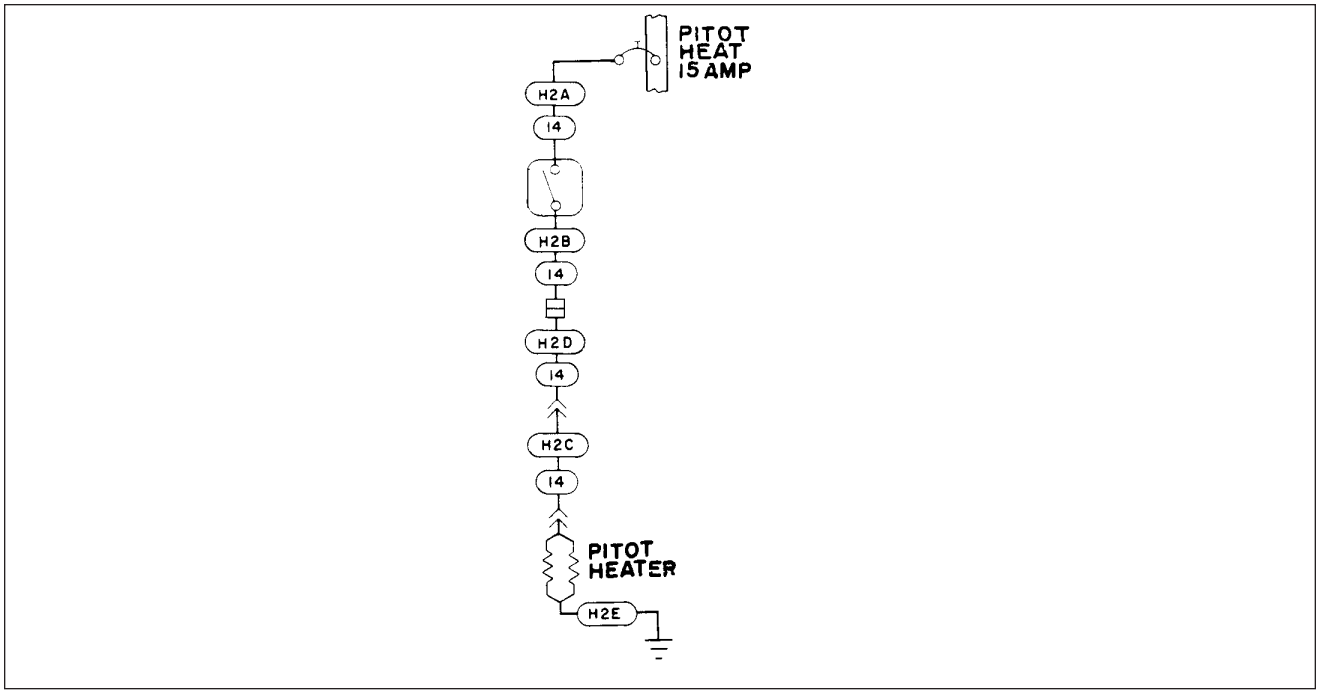


Figure 91-6. Pitot Heat (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205

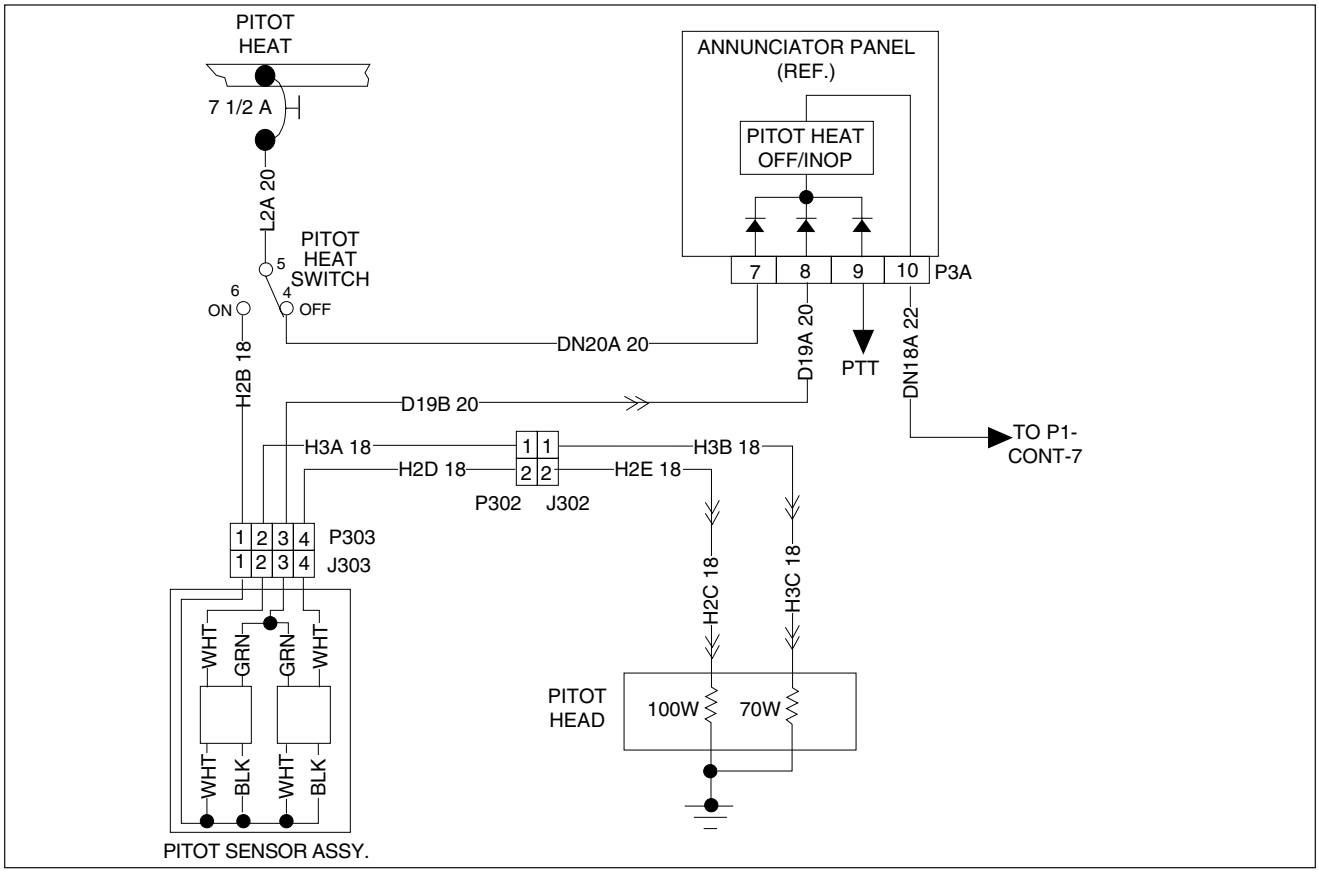


Figure 91-7. Pitot Heat (S/N's 2890206 and up)

THIS PAGE INTENTIONALLY LEFT BLANK

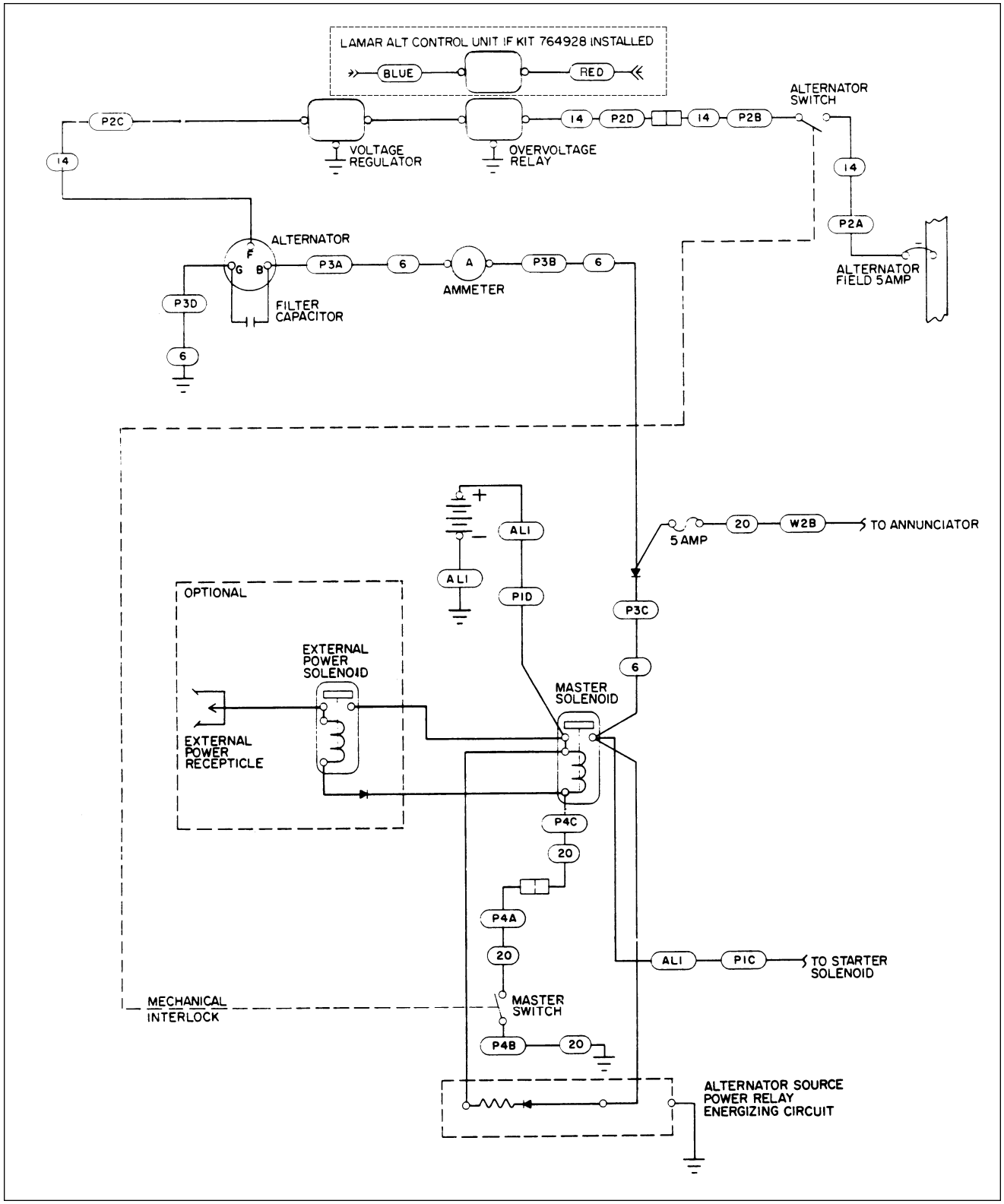


Figure 91-8. Alternator System and External Power (S/N's 28-769000l to 8l90318)

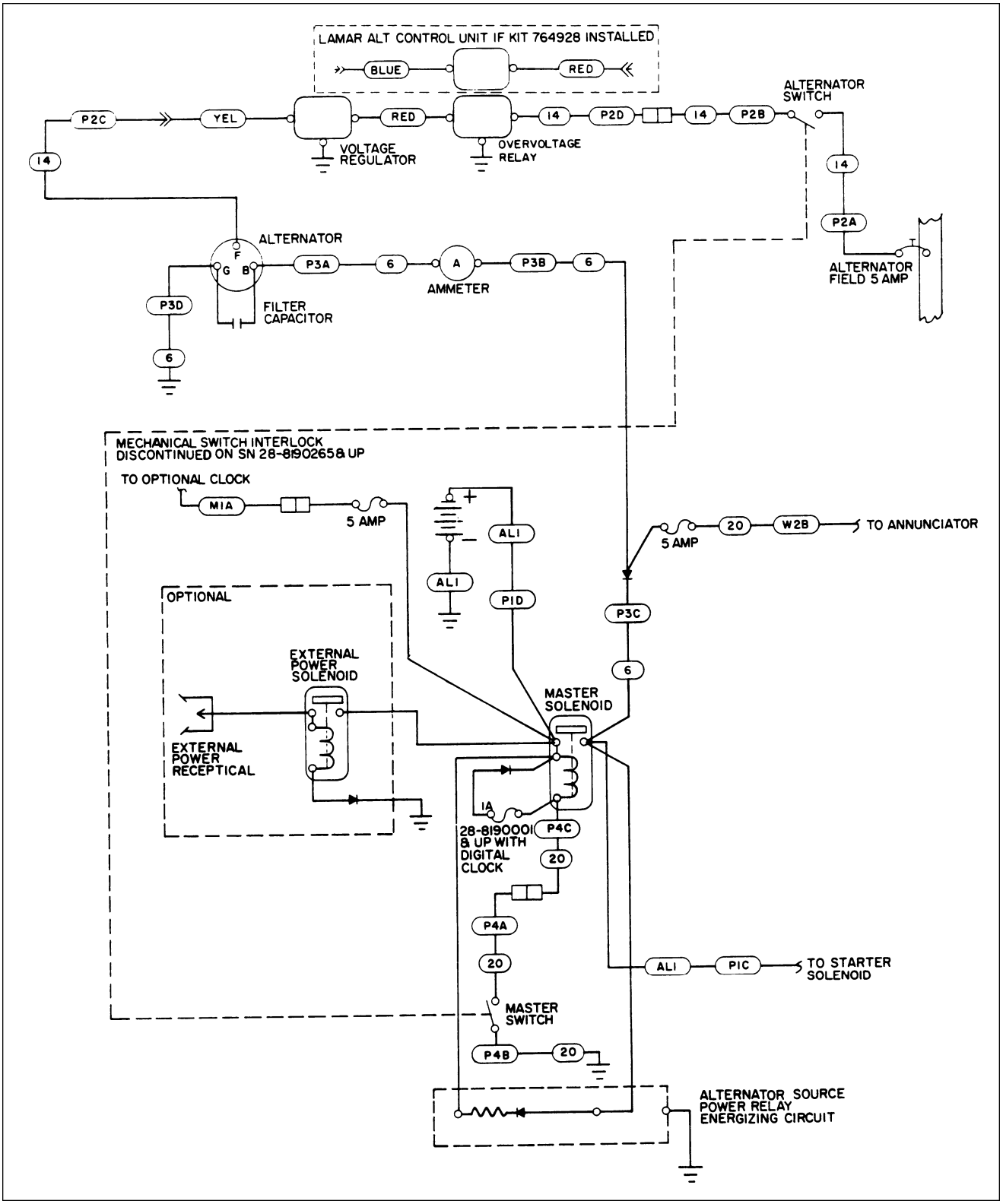


Figure 91-9. Alternator System and External Power (S/N's 28-829000l to 8290l78)

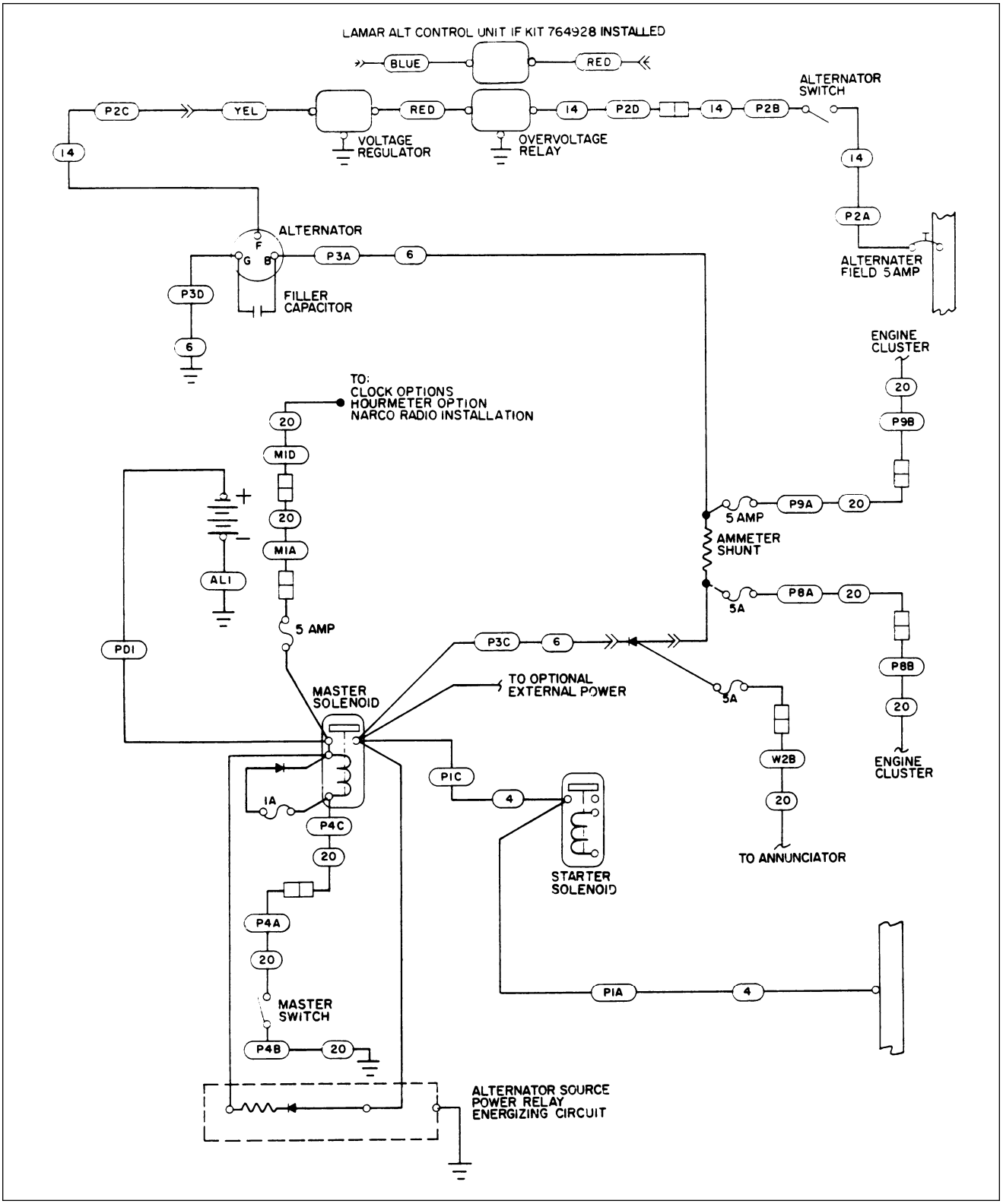


Figure 91-10. Alternator System and External Power (S/N's 28-839000l thru 28-8690056 and 2890001 thru 2890205)

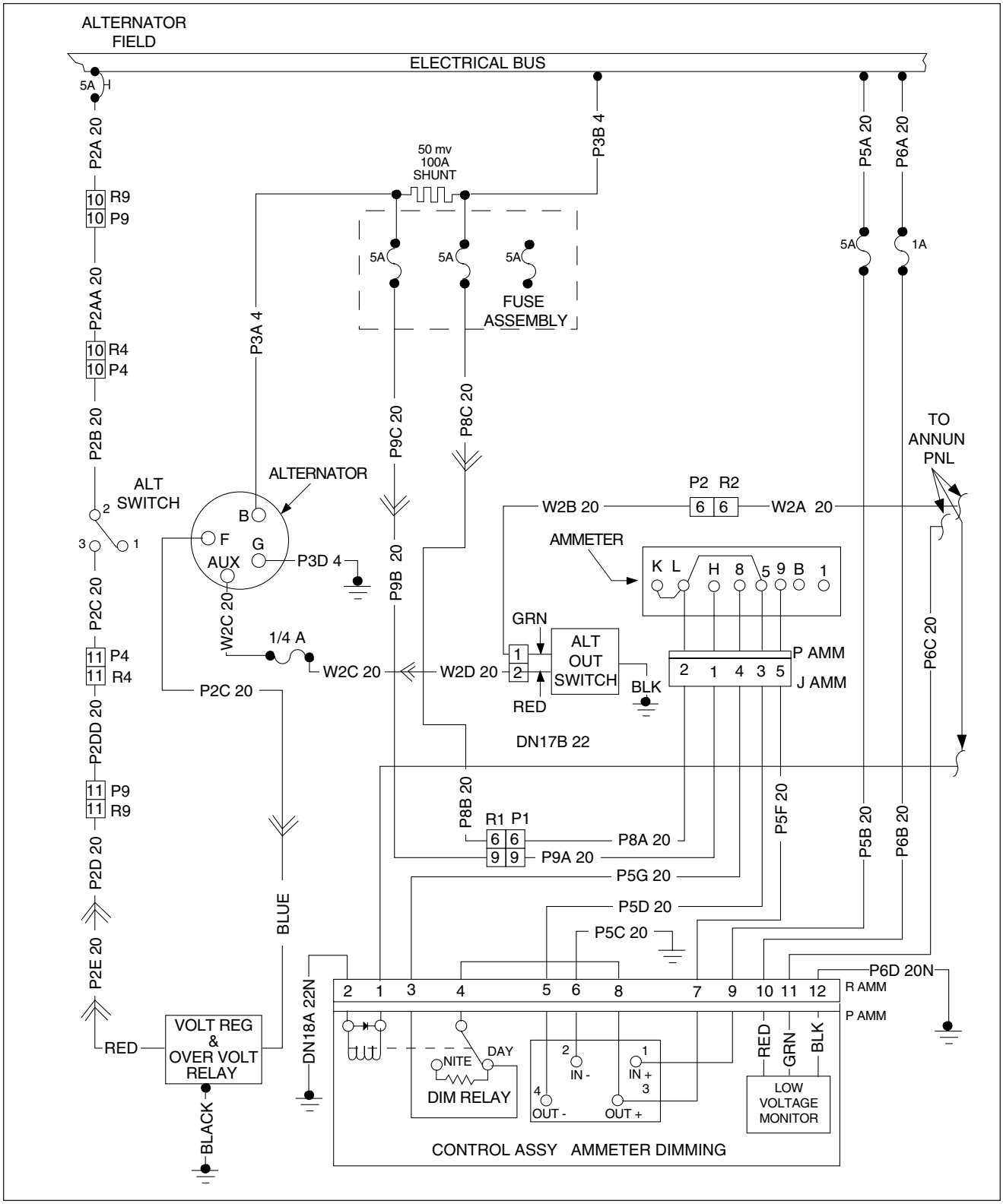


Figure 91-11. Alternator System (S/N's 2890206 and up)

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

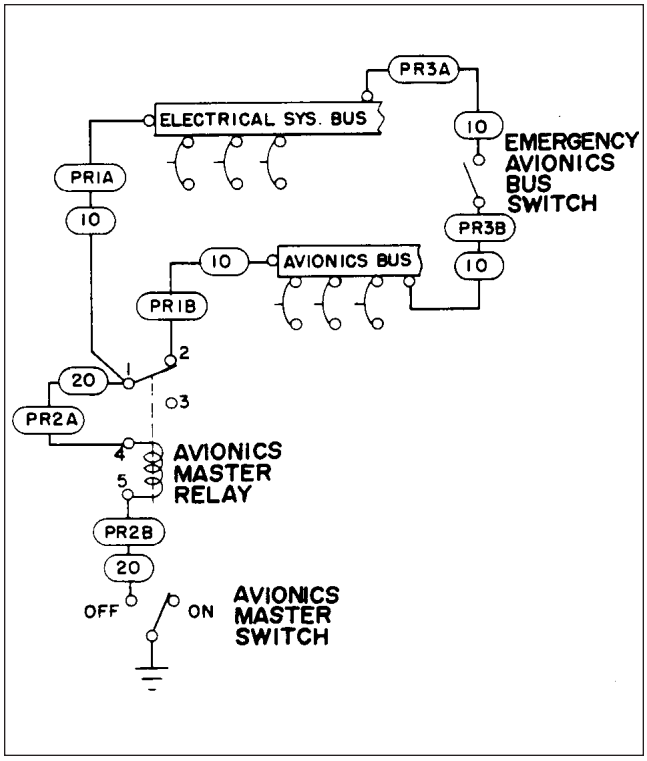


Figure 91-12. Avionics Master (Optional)
S/N's 28-8090001 thru 28-82900l78
(Sheet 1 of 3)

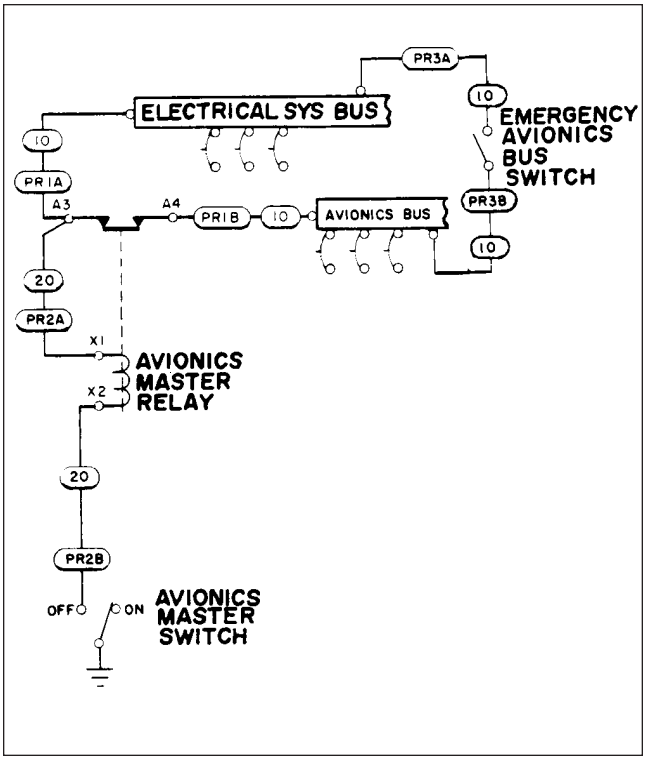


Figure 91-12. Avionics Master (Optional)
S/N's 28-839000l thru 28-8690056 and
2890001 thru 2890205 (Sheet 2 of 3)

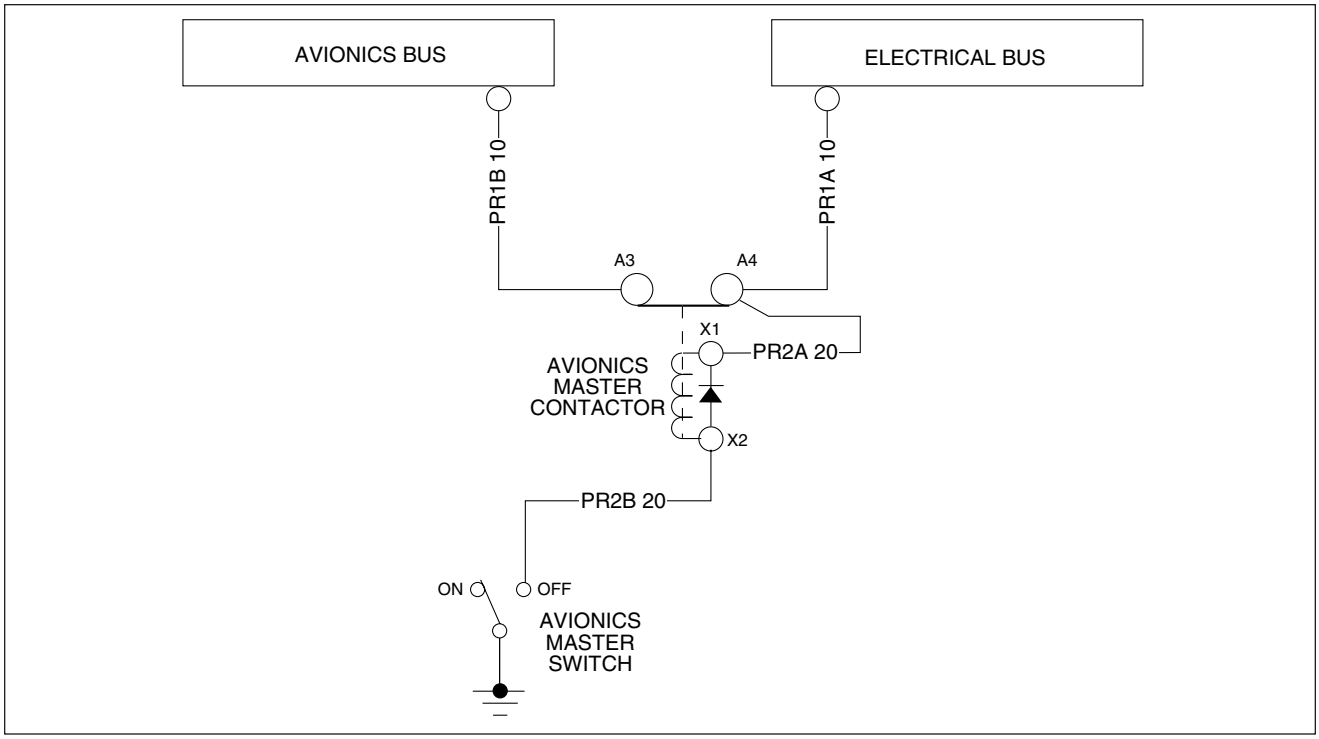


Figure 91-12. Avionics Master (Standard) S/N's 2890206 and up Sheet 3 of 3)

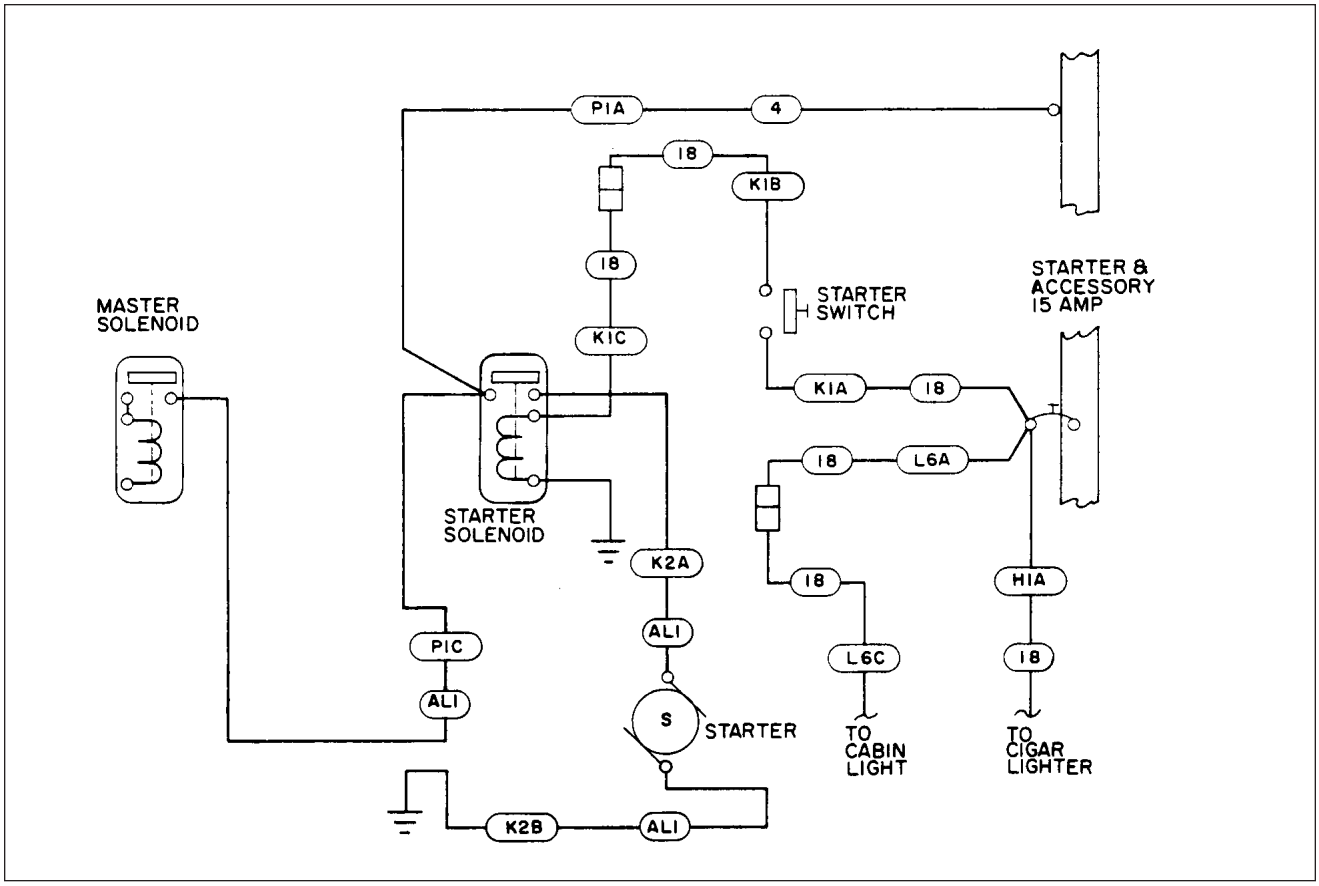


Figure 91-13. Starter - S/Ns S/N's 28-769000l to 28-8l90318 (Sheet 1 of 2)

THIS SPACE INTENTIONALLY LEFT BLANK

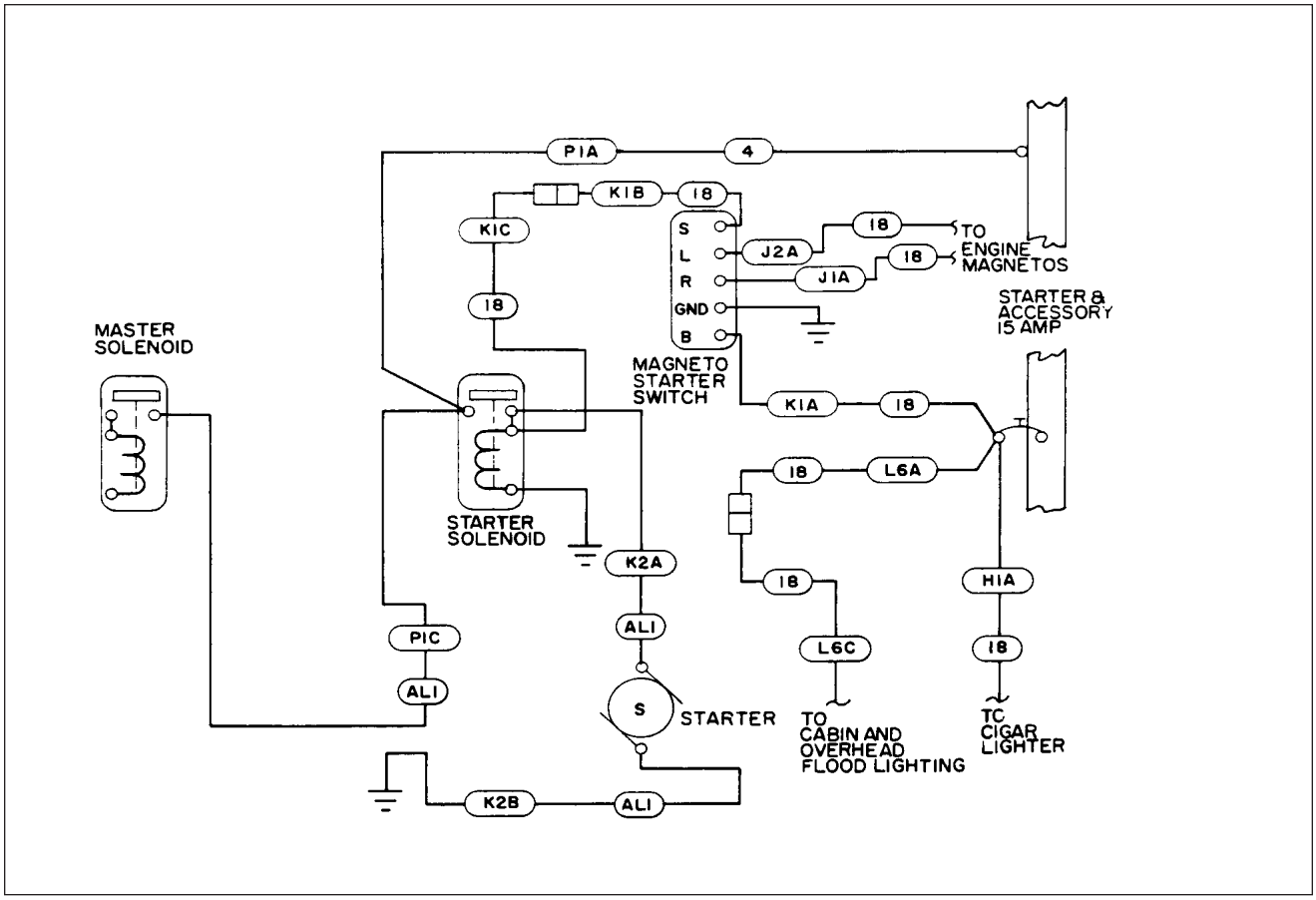


Figure 91-13. Starter - S/N's 28-829000l thru 28-8690056 and 2890001 thru 2890205 (Sheet 2 of 2)

THIS SPACE INTENTIONALLY LEFT BLANK

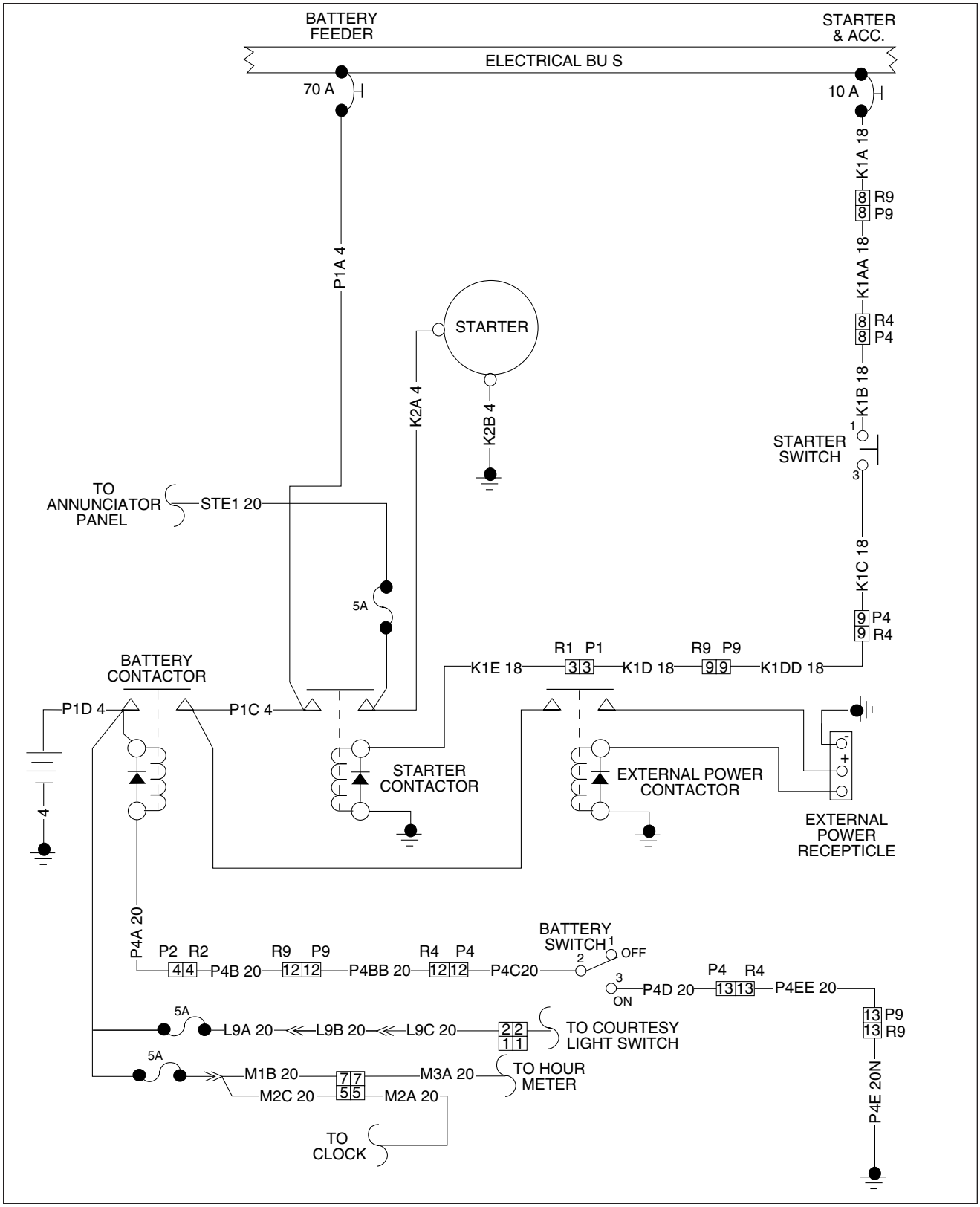


Figure 91-14 . Starter / External Power (S/N's 2890206 and up)

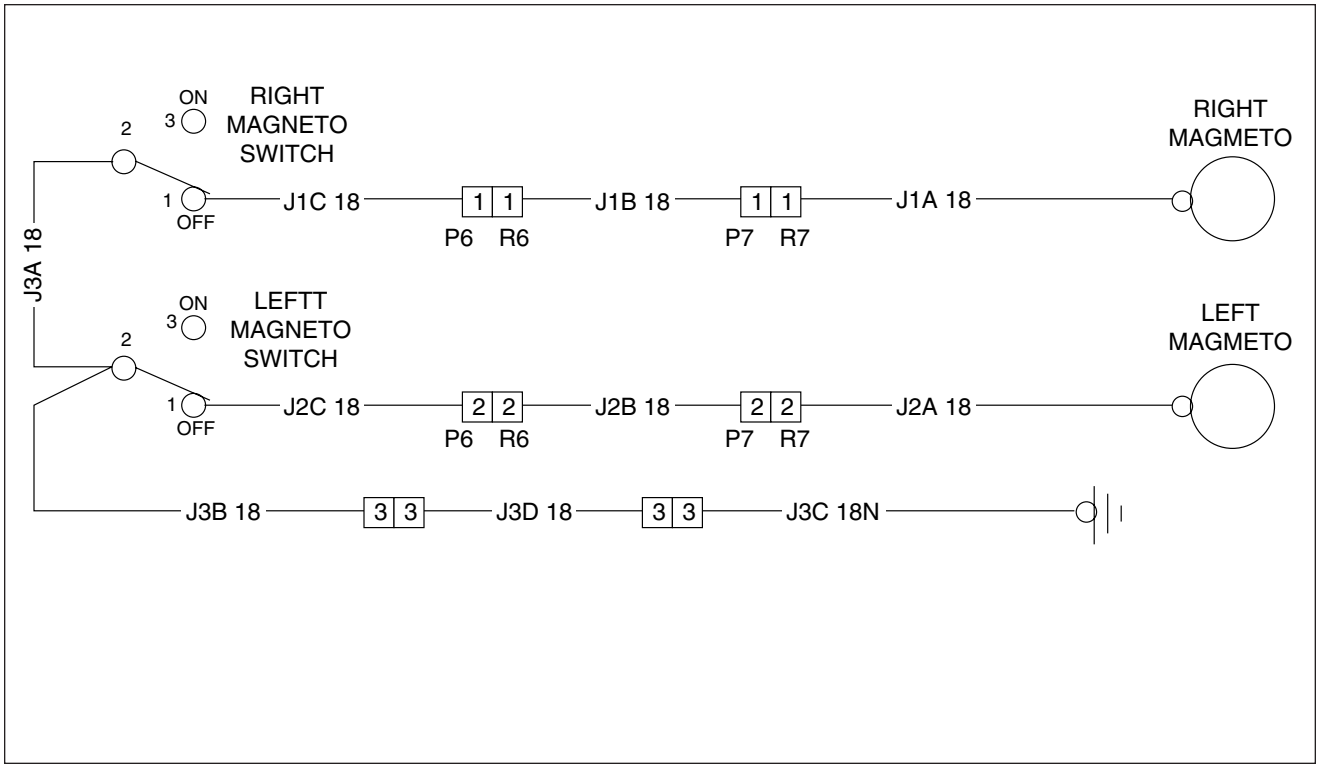
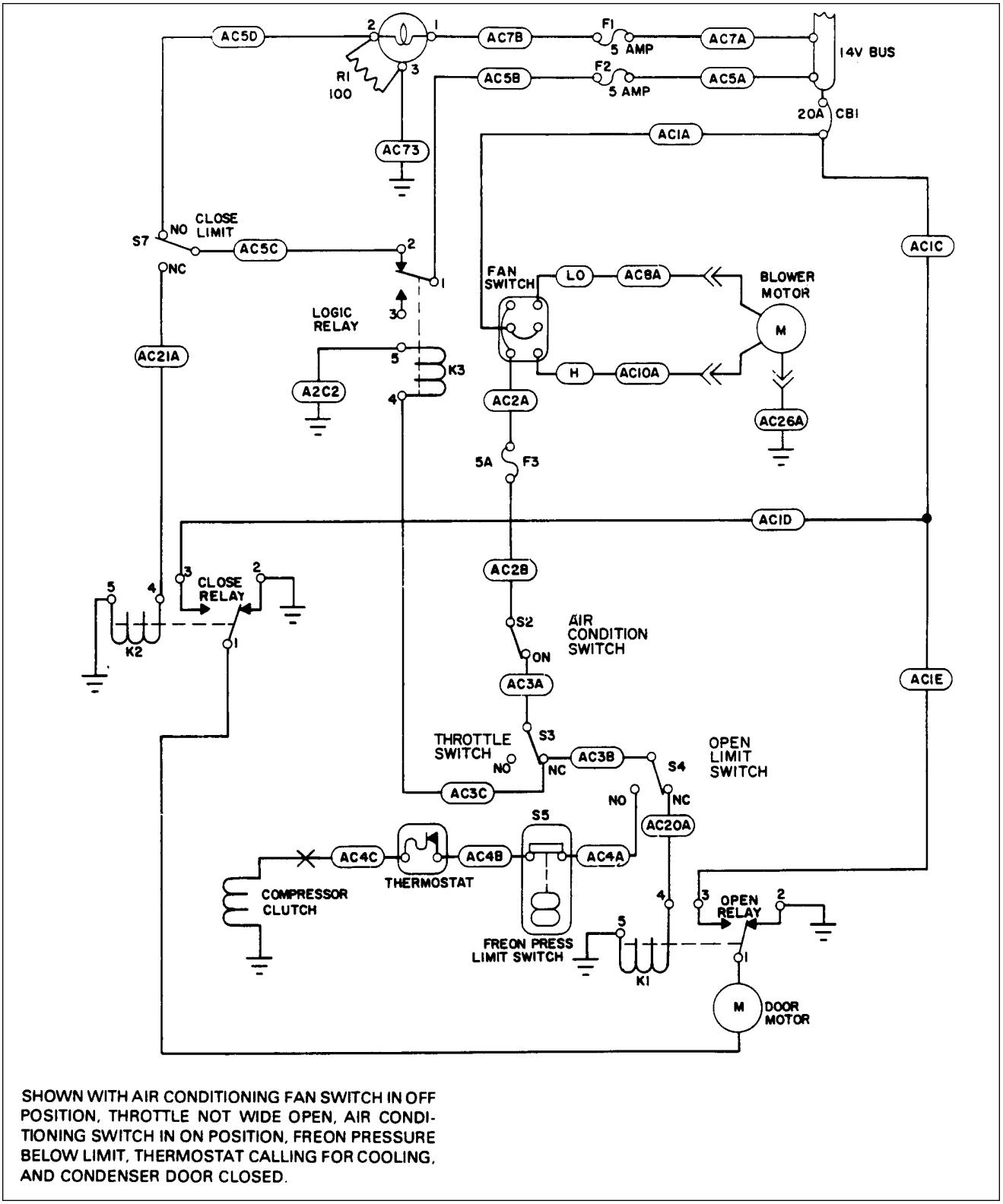


Figure 91-15. Magnetos (S/N's 2890206 and up)

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK



SHOWN WITH AIR CONDITIONING FAN SWITCH IN OFF POSITION, THROTTLE NOT WIDE OPEN, AIR CONDITIONING SWITCH IN ON POSITION, FREON PRESSURE BELOW LIMIT, THERMOSTAT CALLING FOR COOLING, AND CONDENSER DOOR CLOSED.

Figure 91-16. Air Conditioning (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205

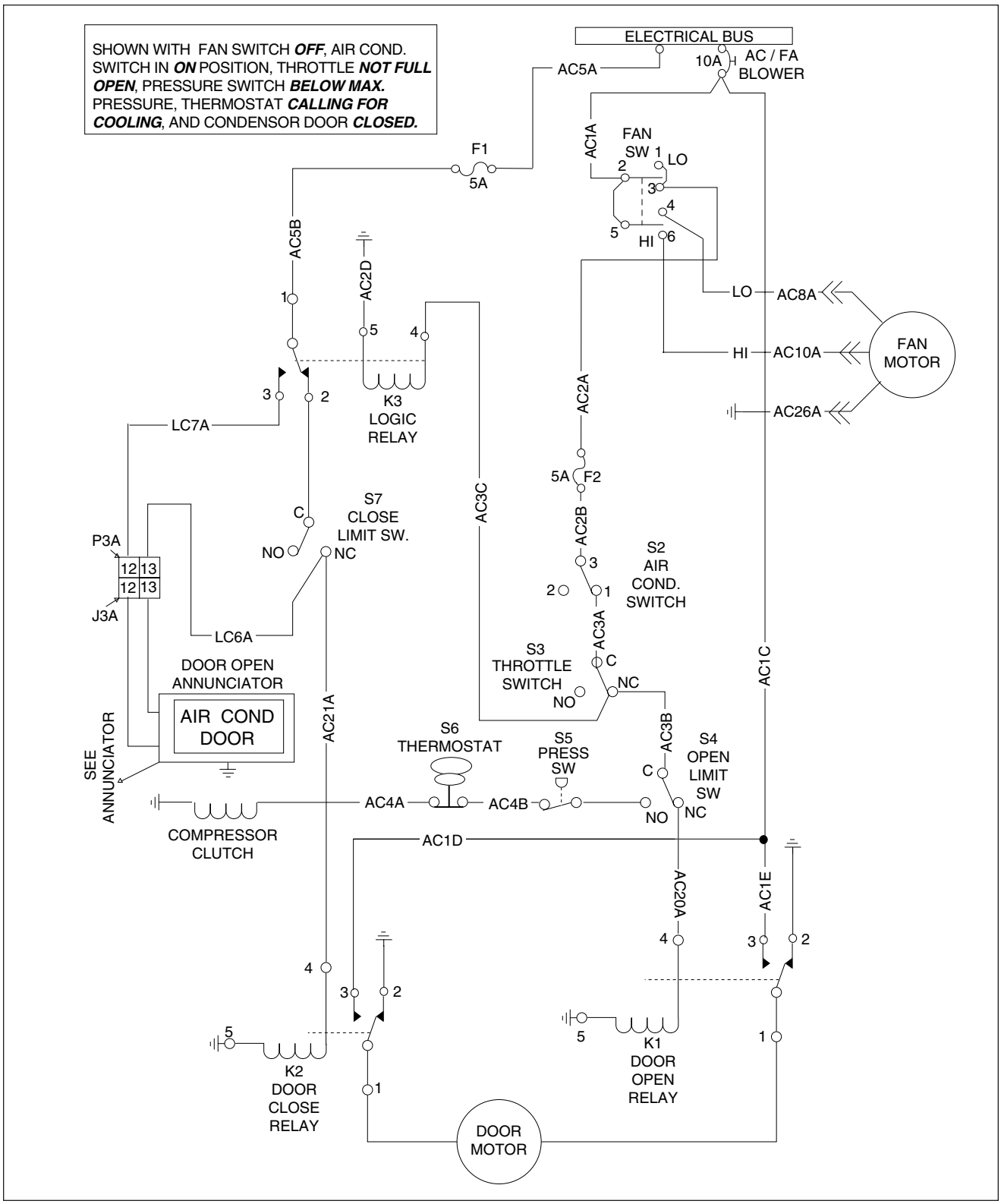


Figure 91-17. Air Conditioniong (S/N's 2890206 and up)

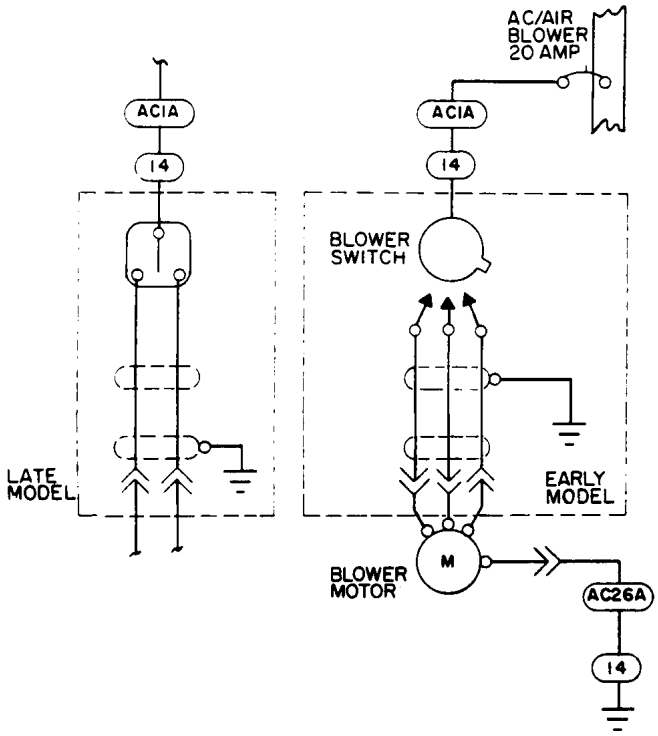


Figure 91-18. Air Conditioning / Air Blower (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)

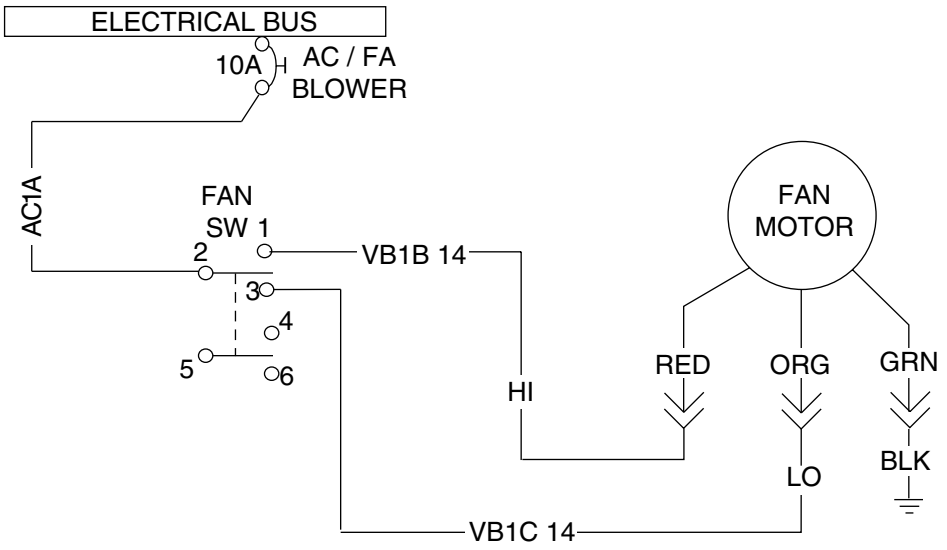


Figure 91-19. Fresh Air Blower (S/N's 2890206 and up)

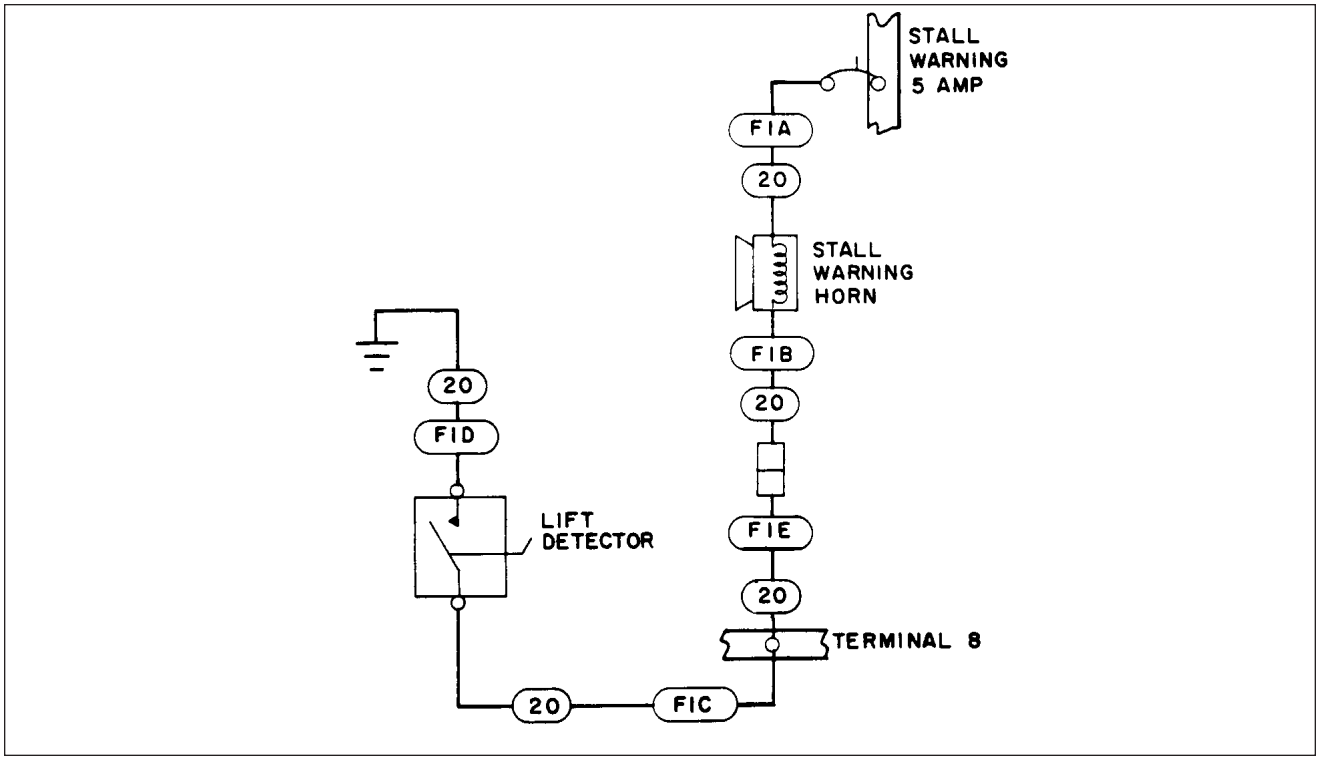


Figure 91-20. Stall Warning (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)
(Sheet 1 of 2)

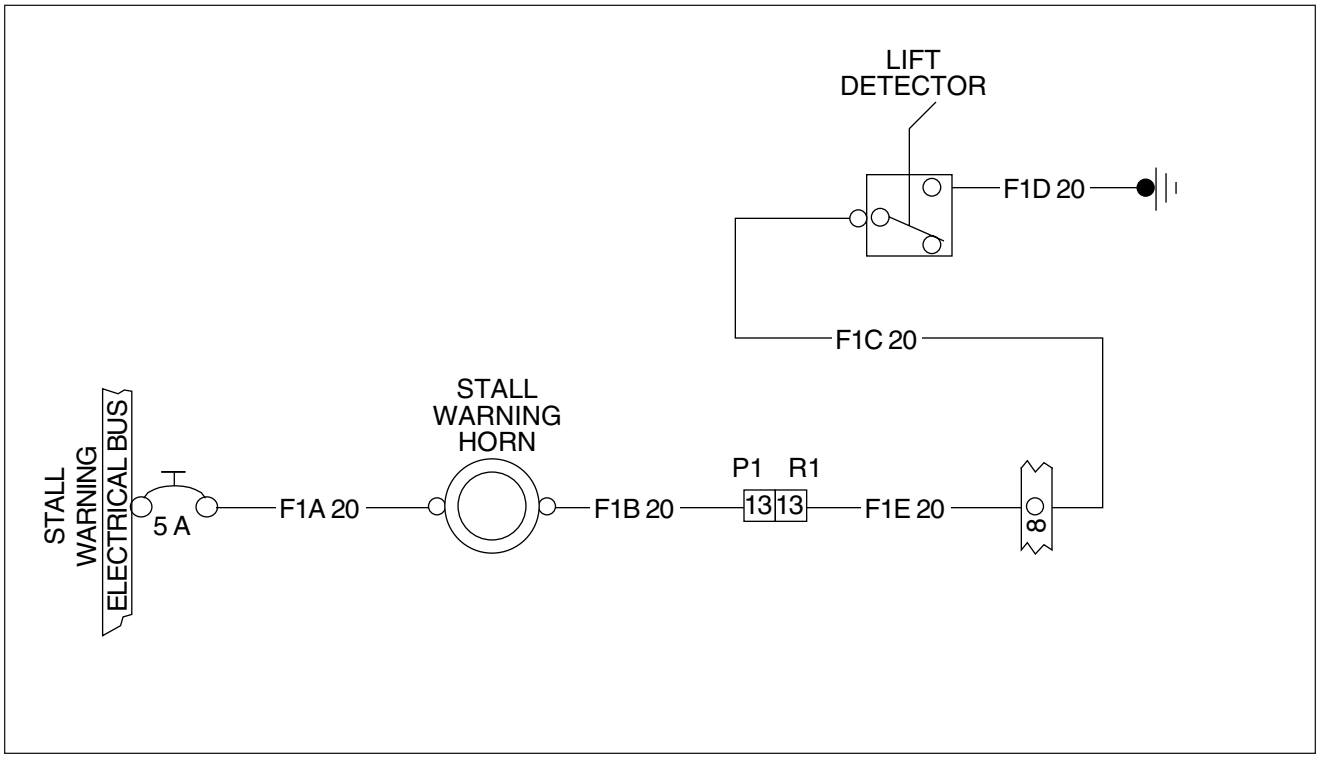


Figure 91-20. Stall Warning (S/N's 2890206 and up.)
(Sheet 2 of 2)

THIS PAGE INTENTIONALLY LEFT BLANK

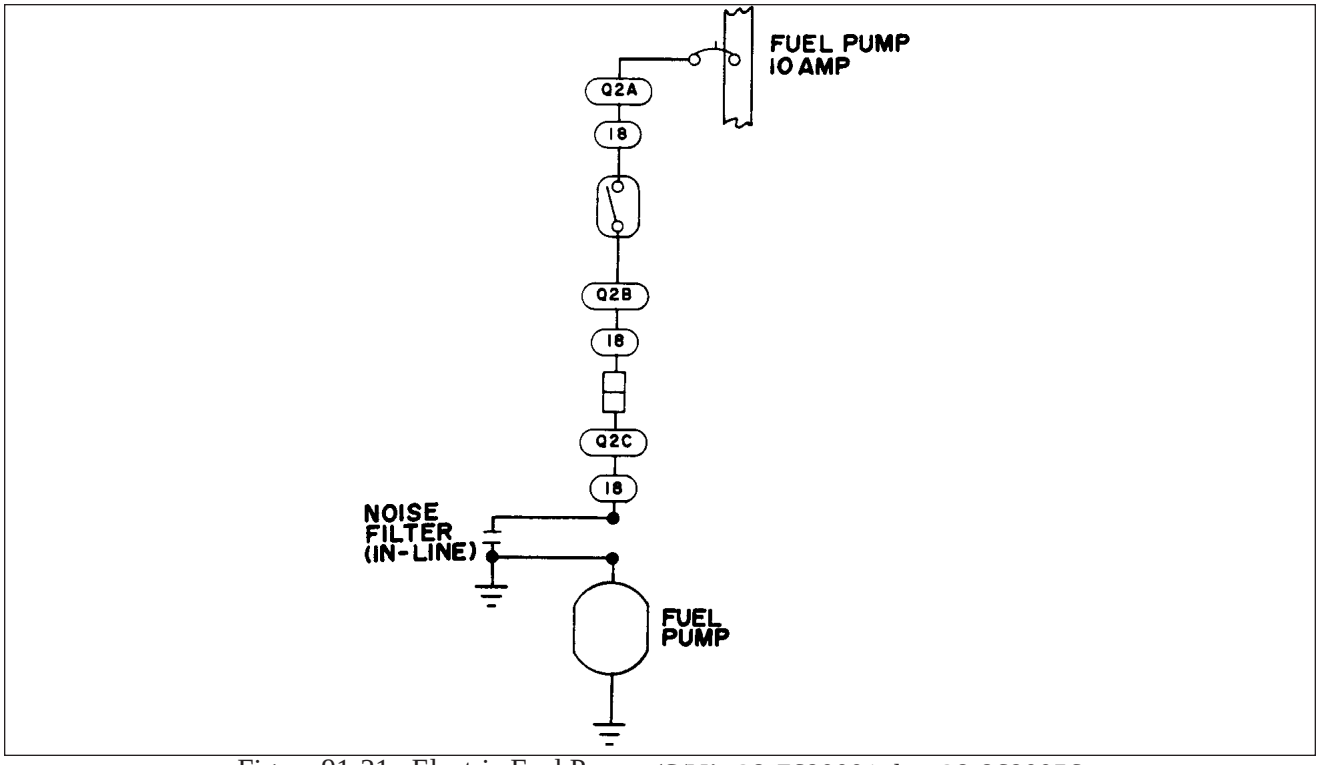


Figure 91-21. Electric Fuel Pump (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)

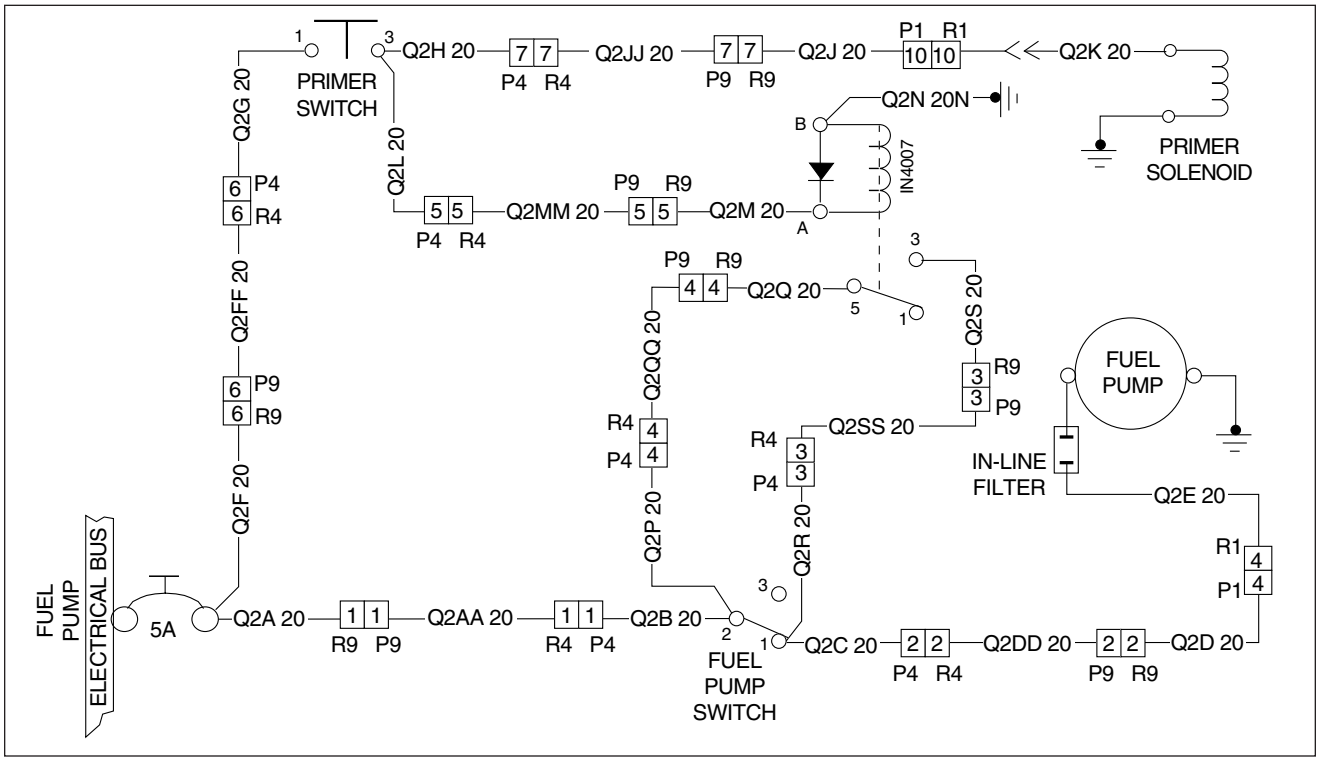


Figure 91-22. Electric Fuel Pump and Engine Primer (S/N's 2890206 and up)

THIS PAGE INTENTIONALLY LEFT BLANK

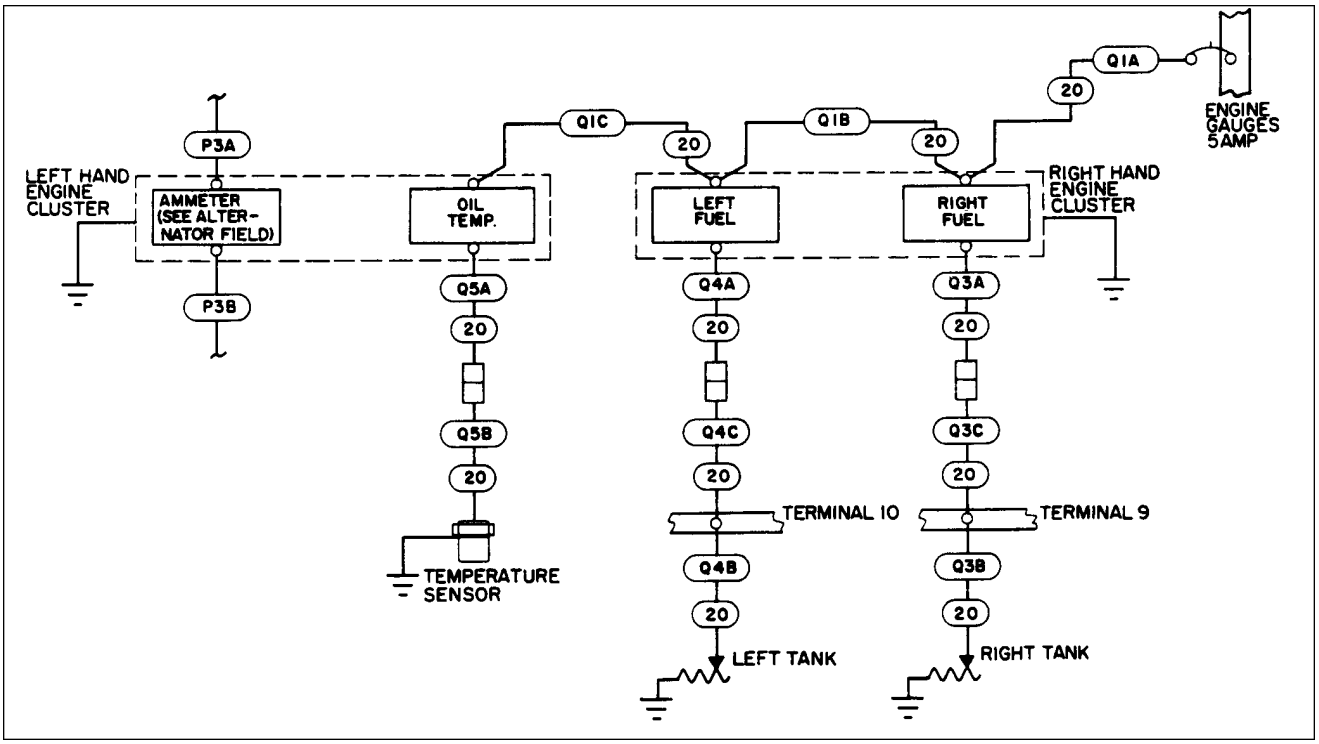


Figure 91-23. Engine Gauges and Senders (S/N's 28-7690001 to 28-7990487)
(Sheet 1 of 2)

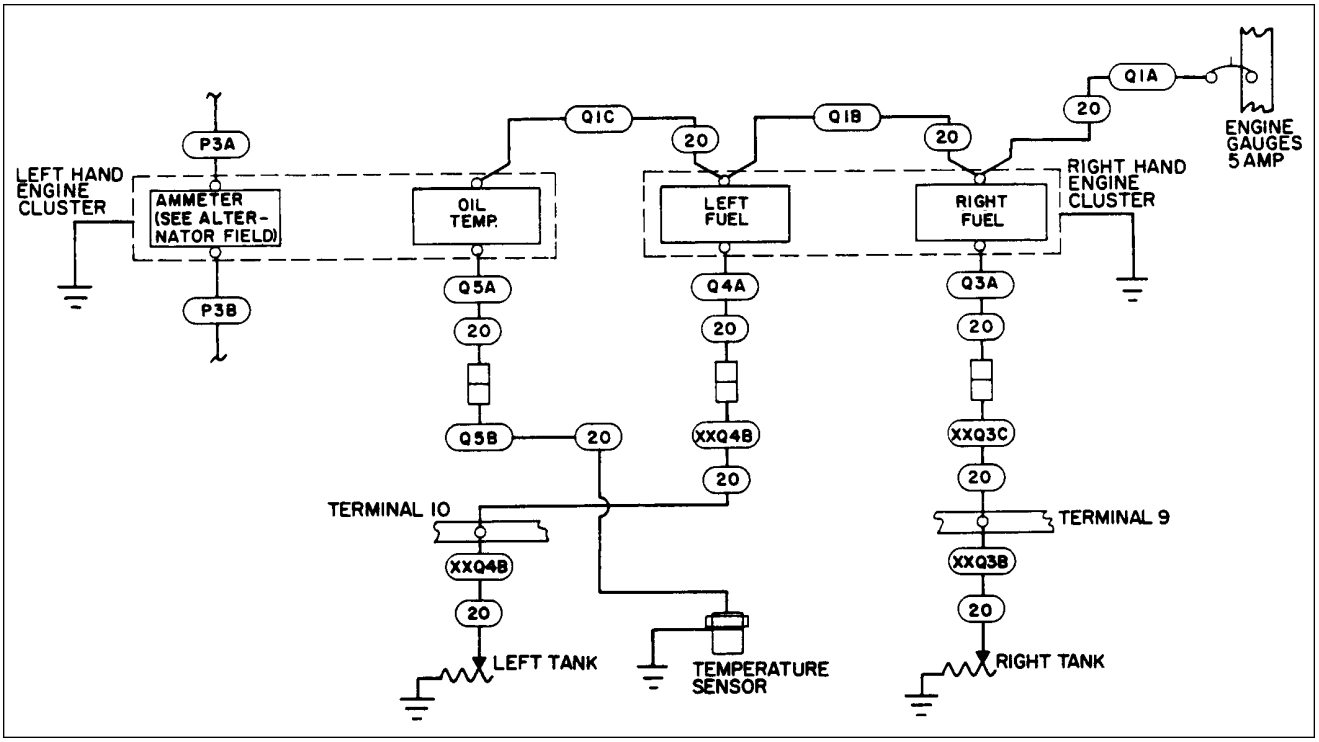


Figure 91-23. Engine Gauges and Senders (S/N'S 28-7990488 thru 28-8690056 and 2890001 thru 2890205)
(Sheet 2 of 2)

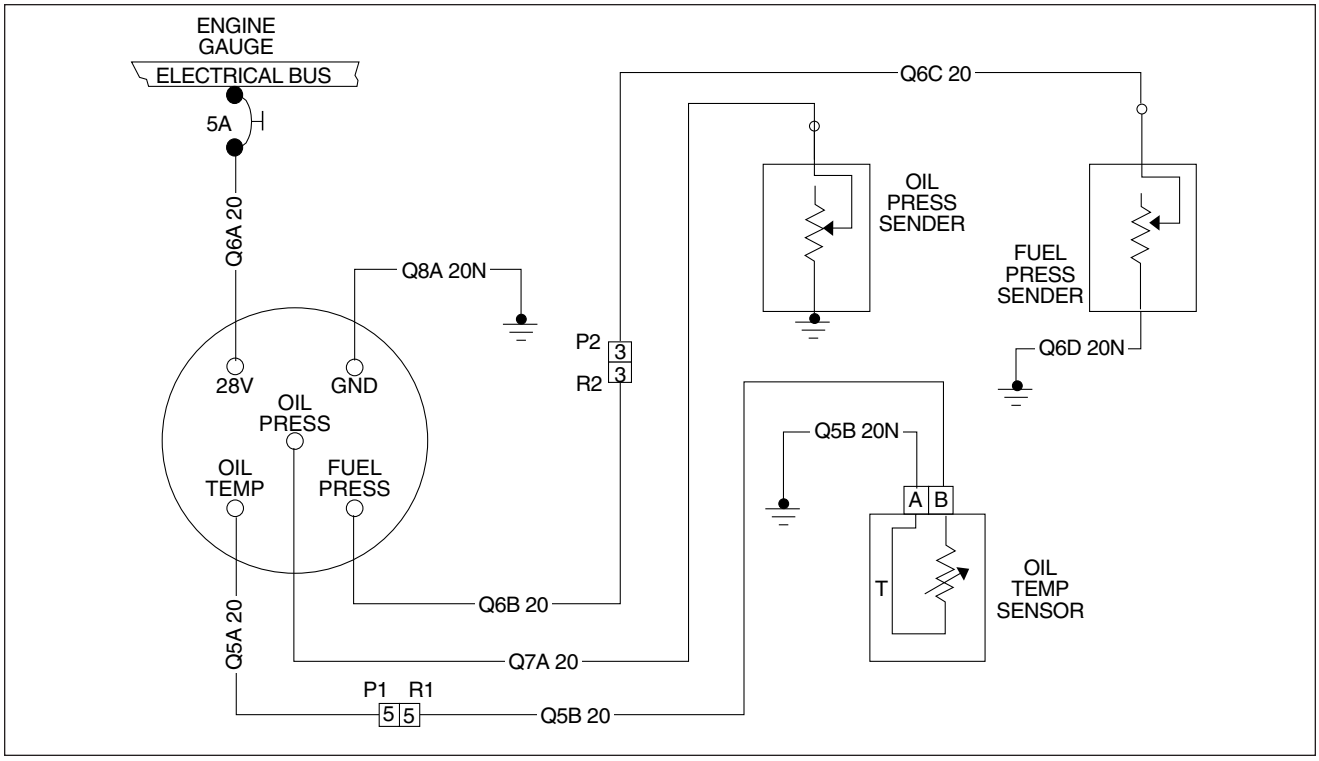


Figure 91-24. Engine Pressure and Temperature Gauge (S/N's 2890206 and up)

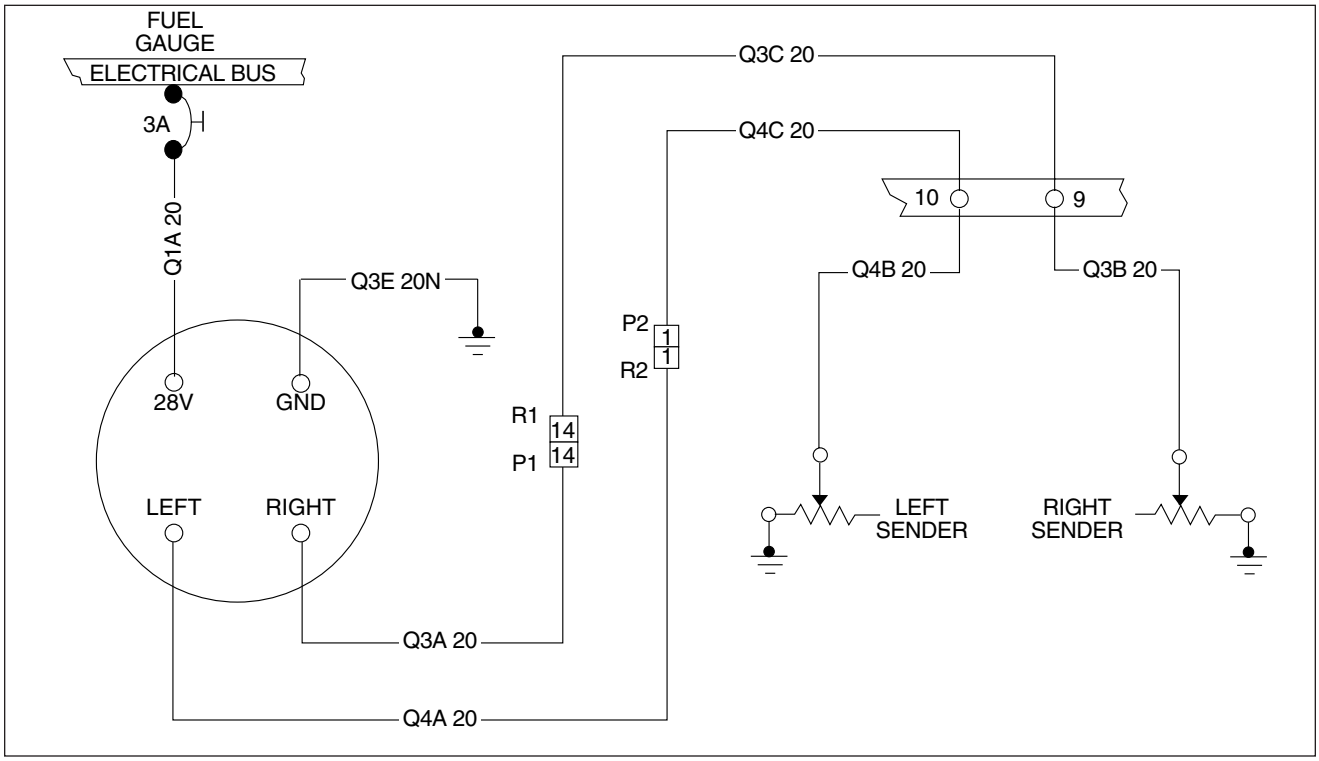


Figure 91-25. Fuel Gauge (S/N's 2890206 and up)

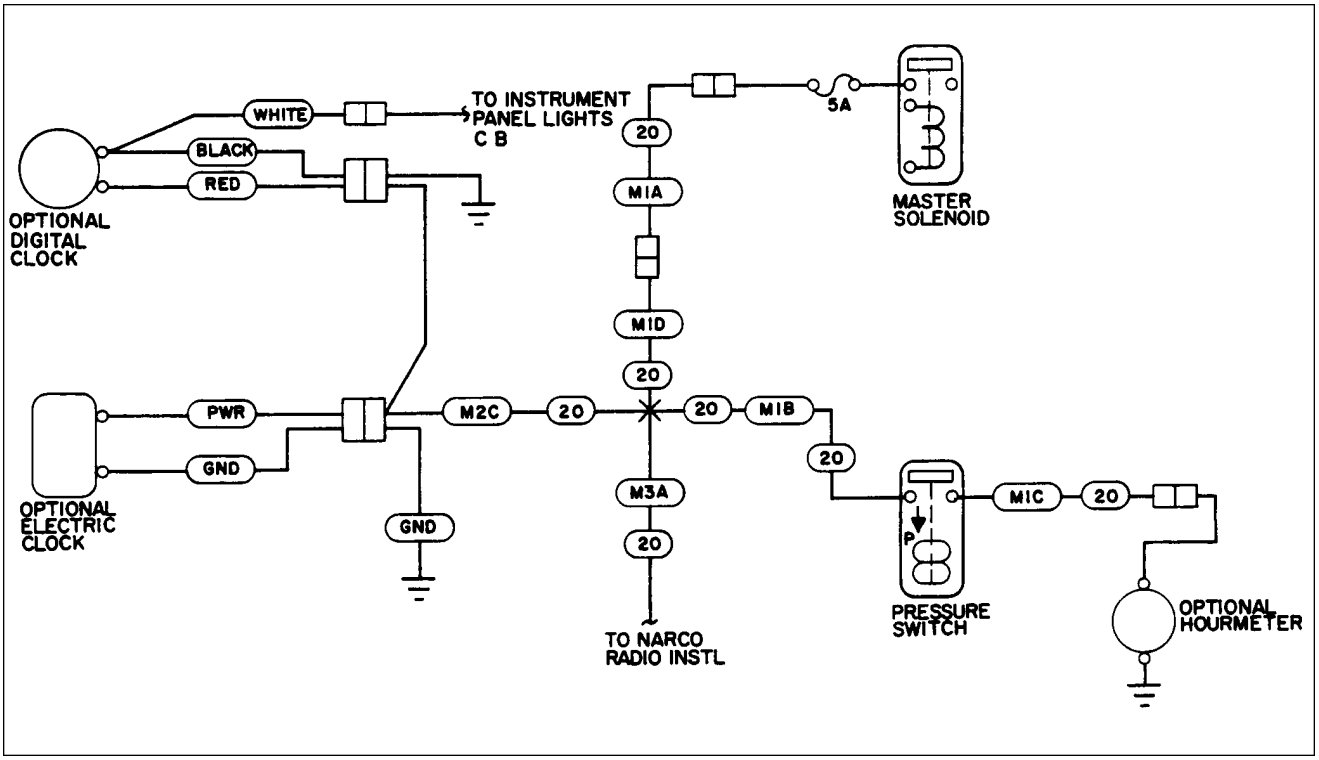


Figure 91-26. Optional Clocks and Hourmeter Installation (S/N's 28-819001 to 28-8290069)
(Sheet 1 of 2)

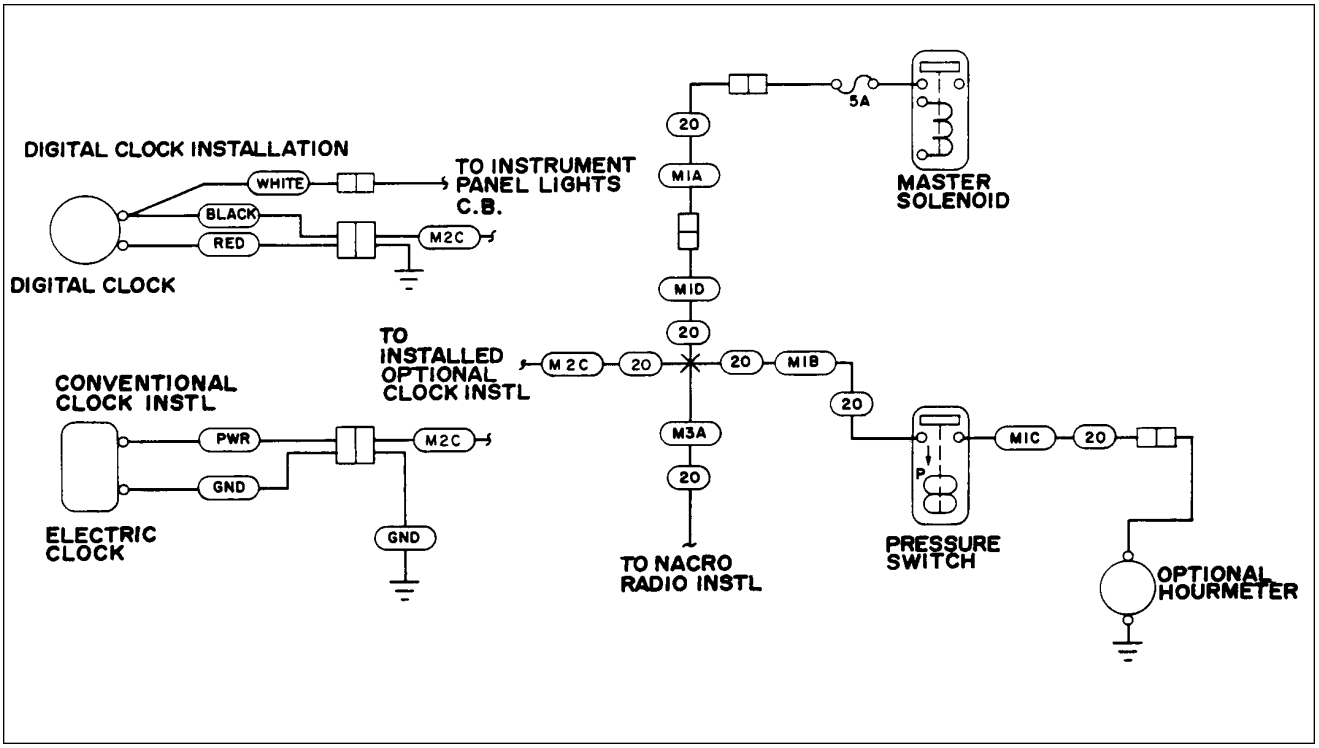


Figure 91-26. Optional Clocks and Hourmeter Installation (S/N's 28-8290070 thru 28-8690056
and 2890001 thru 2890205) (Sheet 2 of 2)

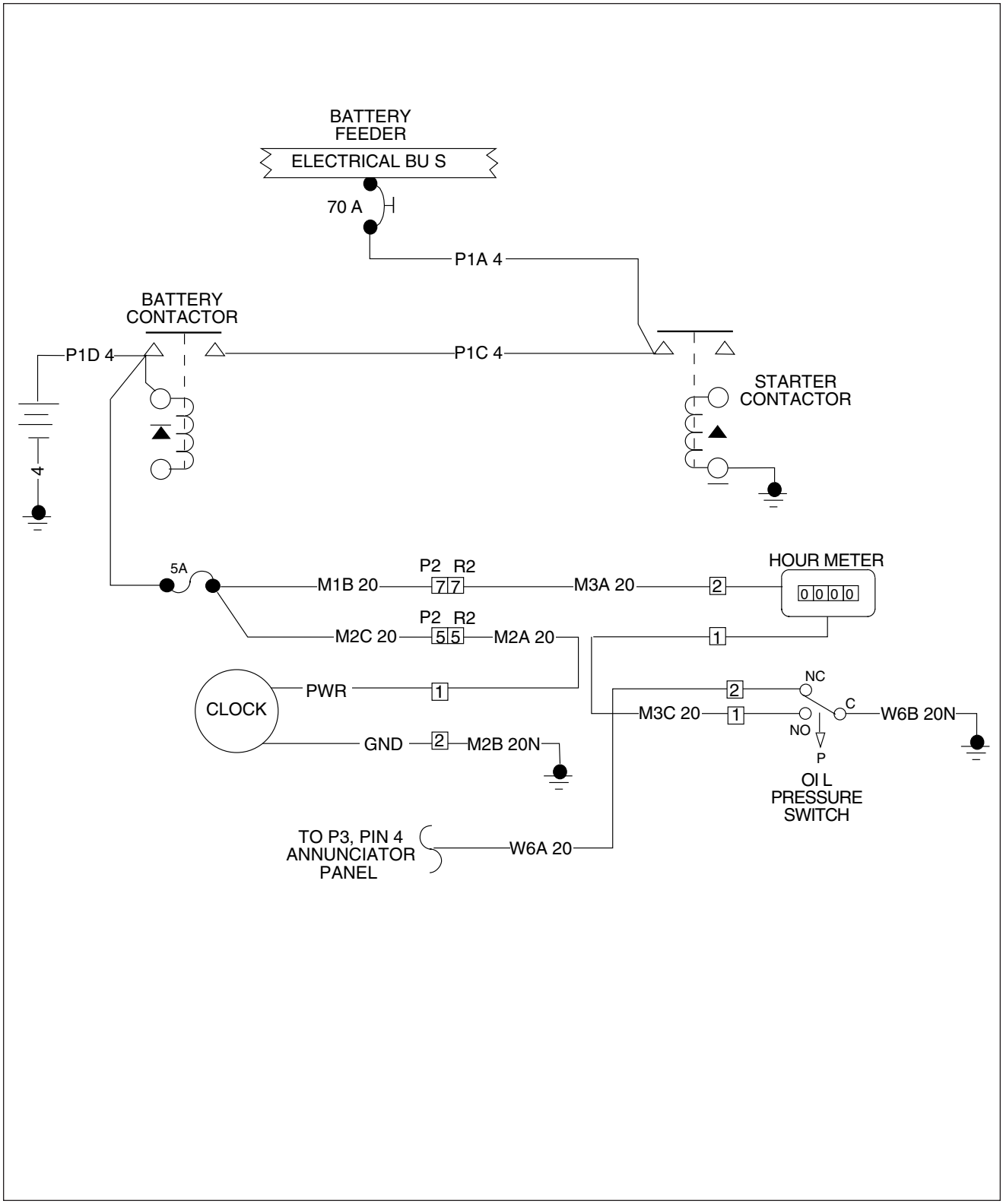


Figure 91-27. Clock) and Hour Meter Installation
(S/N's 28900206)

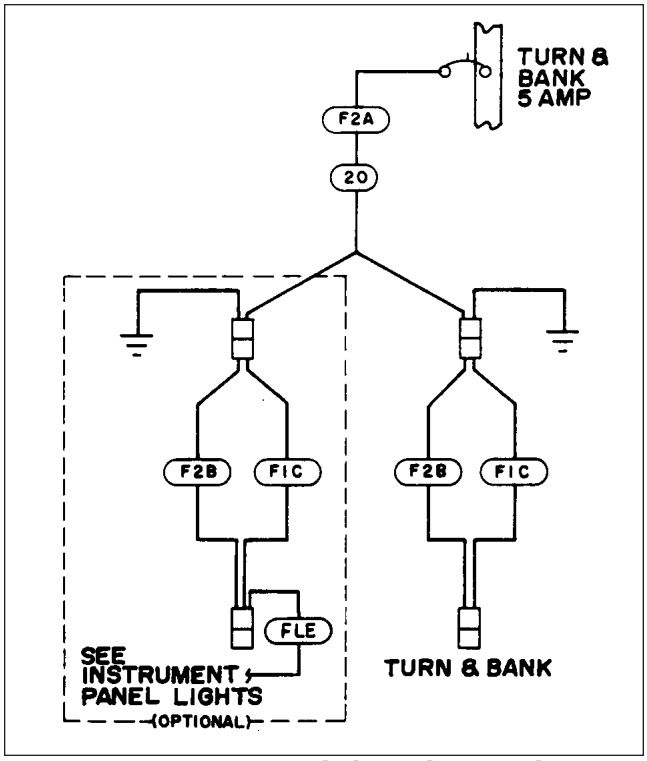


Figure 91-28. Turn and Slip and Optioanl Unit with Lighted Face(S/N's 28-7690001 thru 28-8690056 and 2890001 thru2890205)

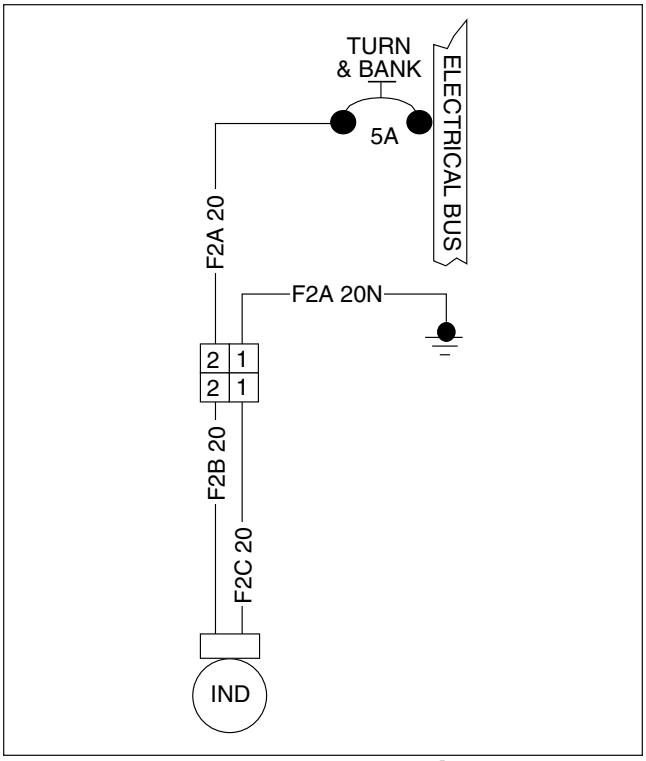


Figure 91-29. Turn Coordinator (S/N's 28900206 and up)

THIS SPACE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

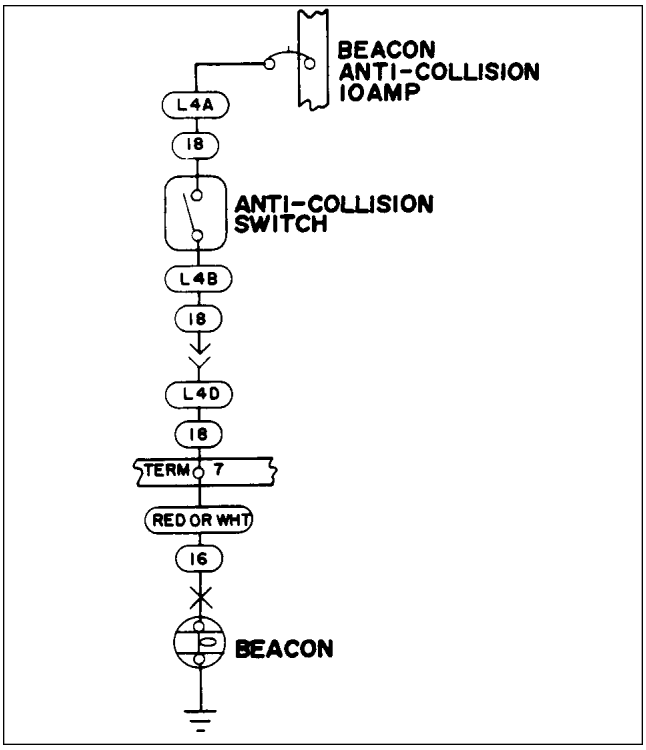


Figure 91-30. Anti-Collision Beacon (S/N's 28-7690001 thru 28-7990220)

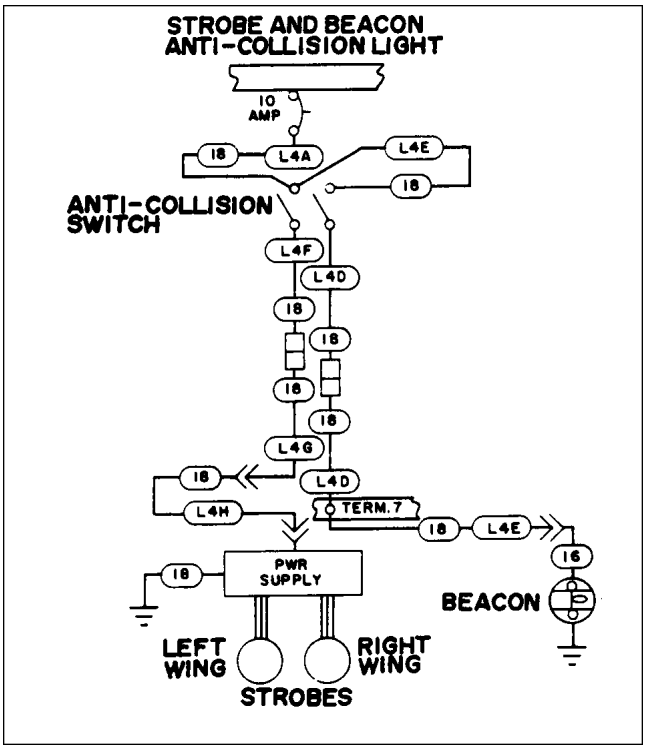


Figure 91-31. Anti-Collision Wing Strobes and Beacon (S/N's 28-7690001 thru 28-7990220 (Sheet 1 of 2)

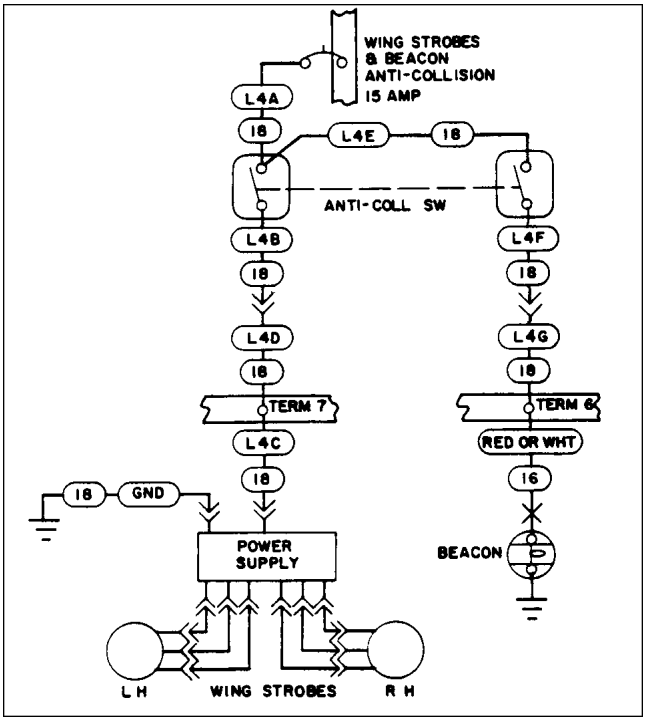


Figure 91-31. Anti-Collision Wing Strobes and Beacon S/N's 28-7990221 thru 28-8690056 and 2890001 thru 2890205 (Sheet 2 of 2)

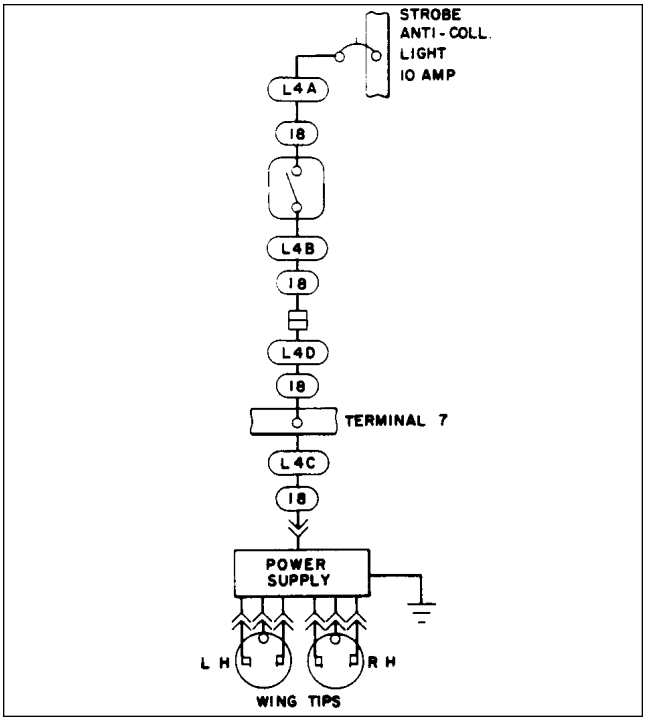


Figure 91-32. Anti-Collision Wing Strobes S/N's 28-7690001 thru S/N's 28-7690220 (Sheet 1 of 2)

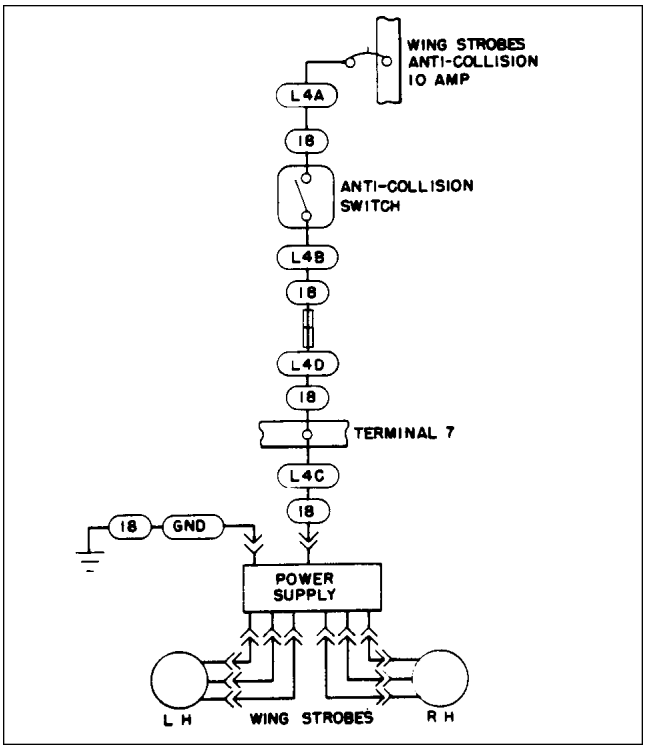


Figure 91-32. Anti-Collision Wing Strobes S/N's 28-7990221 thru 28-8690056 and 2890001 thru 2890205 (Sheet 2 of 2)

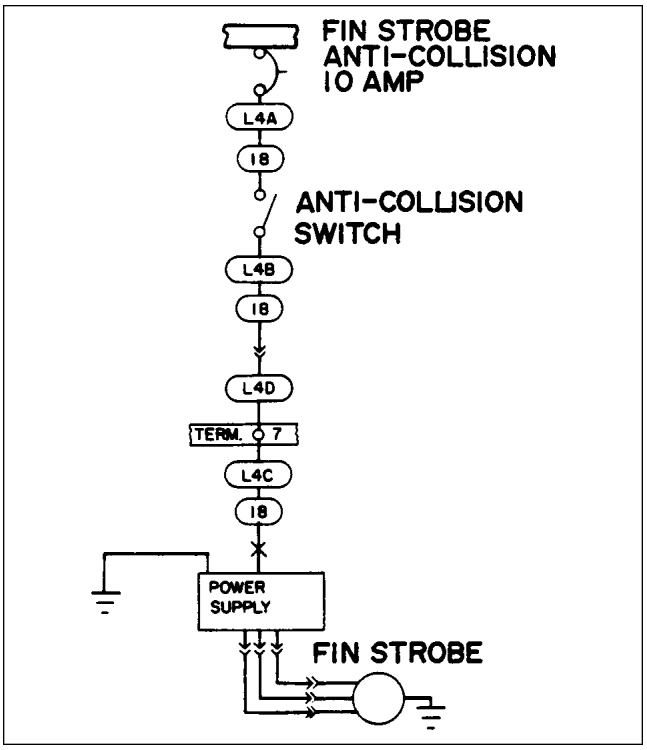


Figure 91-33. Anti-Collision Fin Strobe S/N's 28-7990221 thru 28-8190109

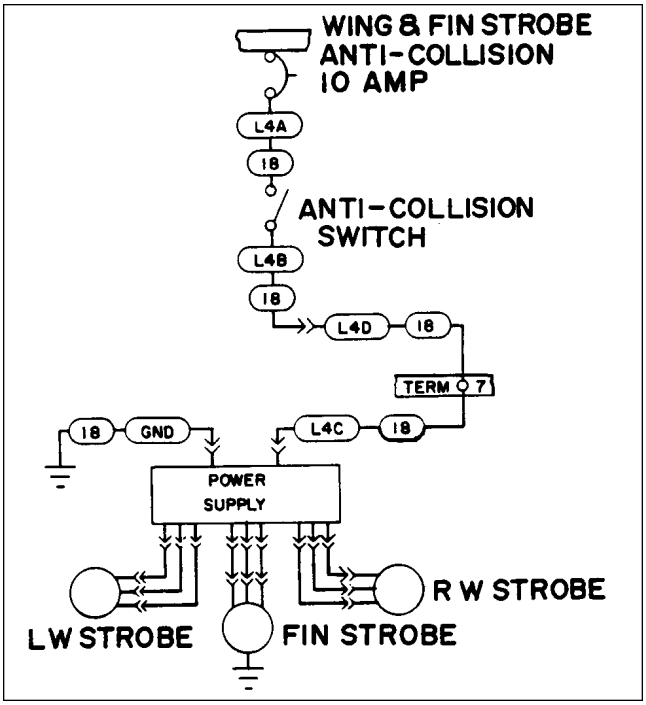


Figure 91-34. Anti-Collision Wing and Fin Strobe (S/N's 28-7990221 thru 28-8190109)

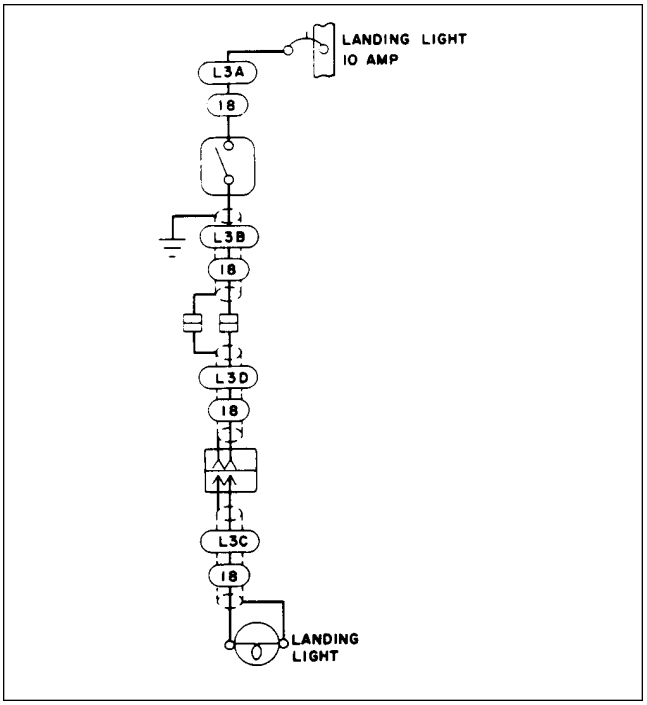


Figure 91-35 Landing Light. (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205) (Sheet 1 of 2)

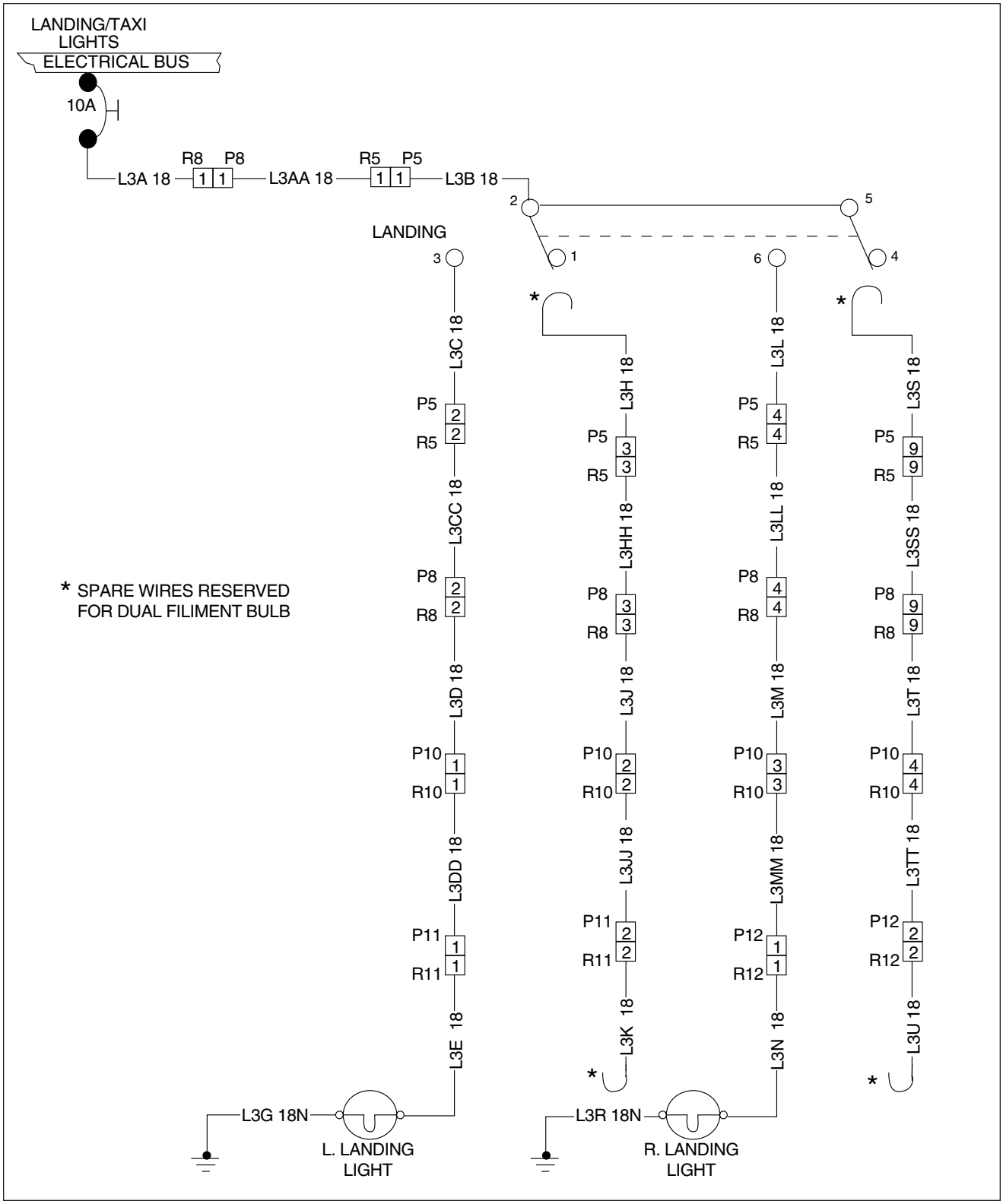


Figure 91-35 Landing Light. (S/N's 28900206 and up)
(Sheet 2 of 2)

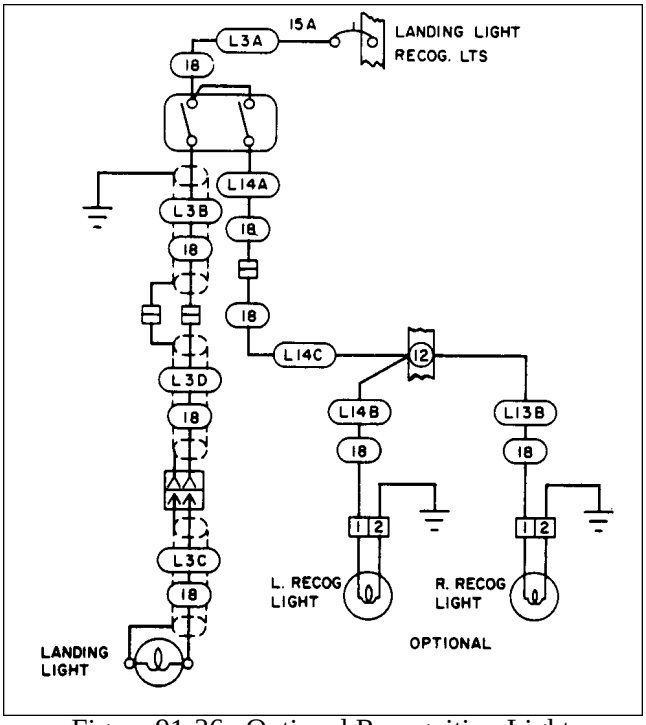


Figure 91-36. Optional Recognition Lights (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205)

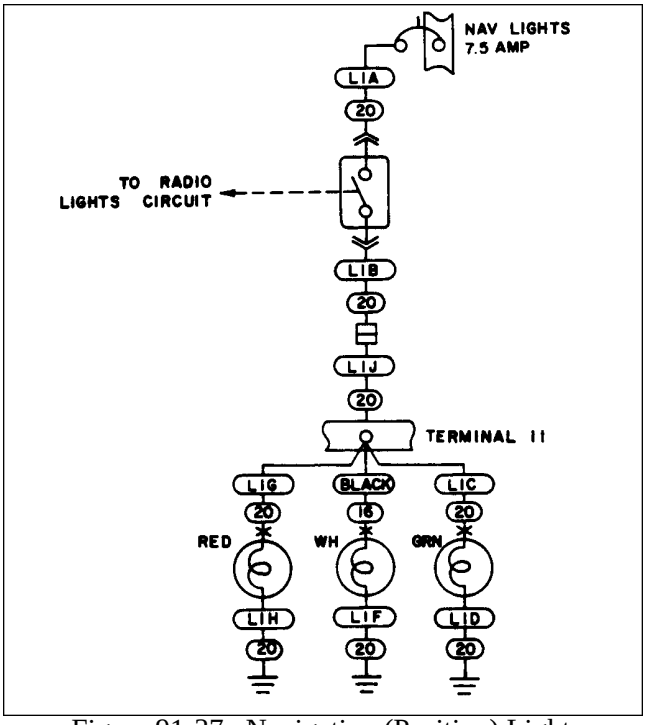


Figure 91-37. Navigation (Position) Lights (S/N's 28-7690001 thru 28-8190318)

THIS SPACE INTENTIONALLY LEFT BLANK

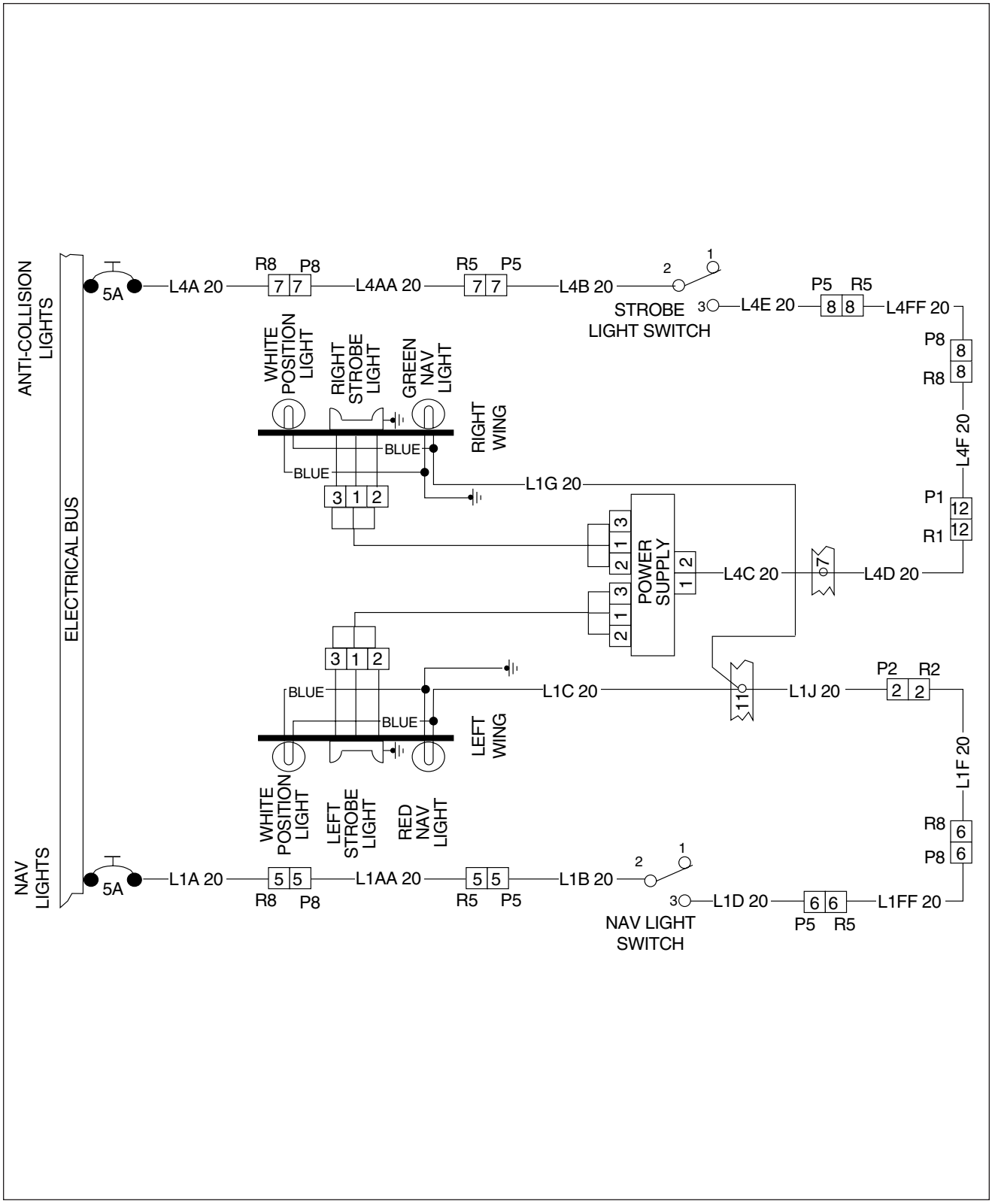


Figure 91-38. Navigation and Anti-Collision Lights (S/N's 28900206 and up)

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

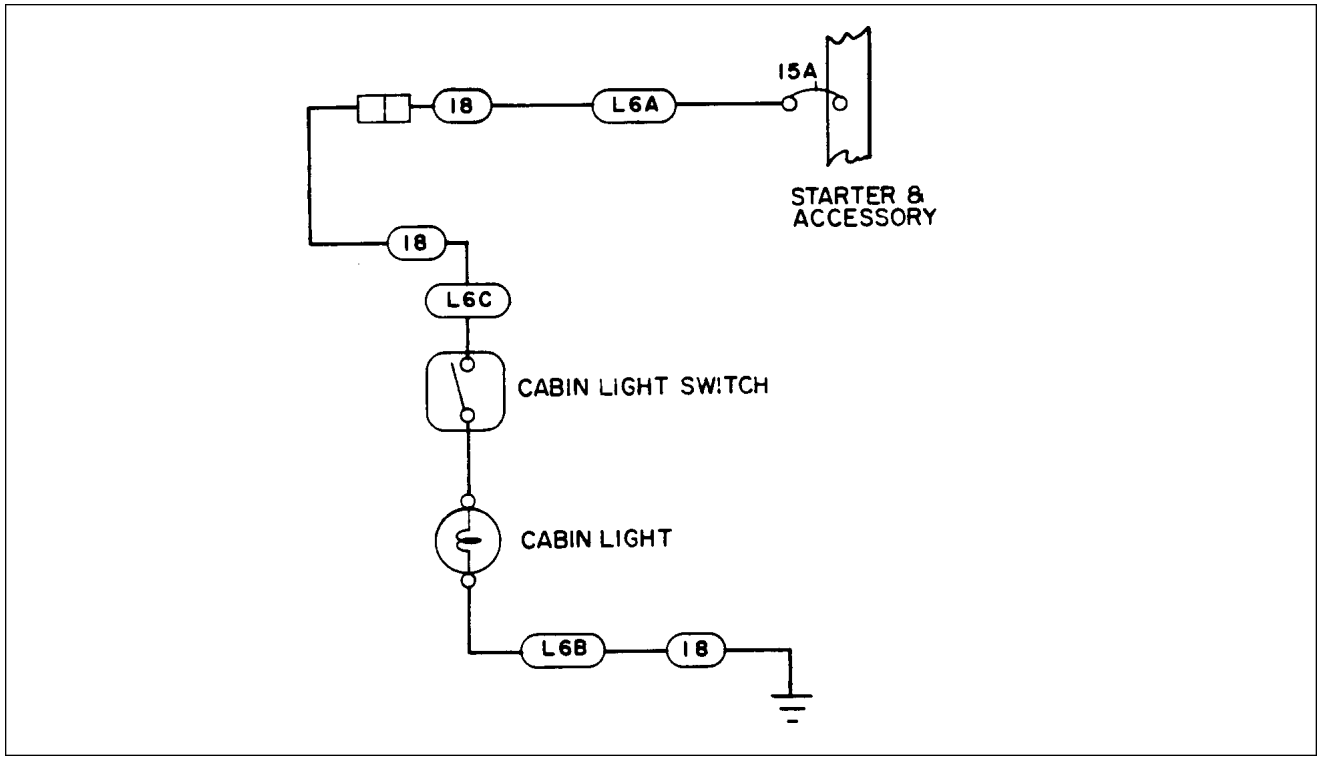


Figure 91-39. Cabin Lights (S/N's 28-7690001 thru 28-8090372)

THIS SPACE INTENTIONALLY LEFT BLANK

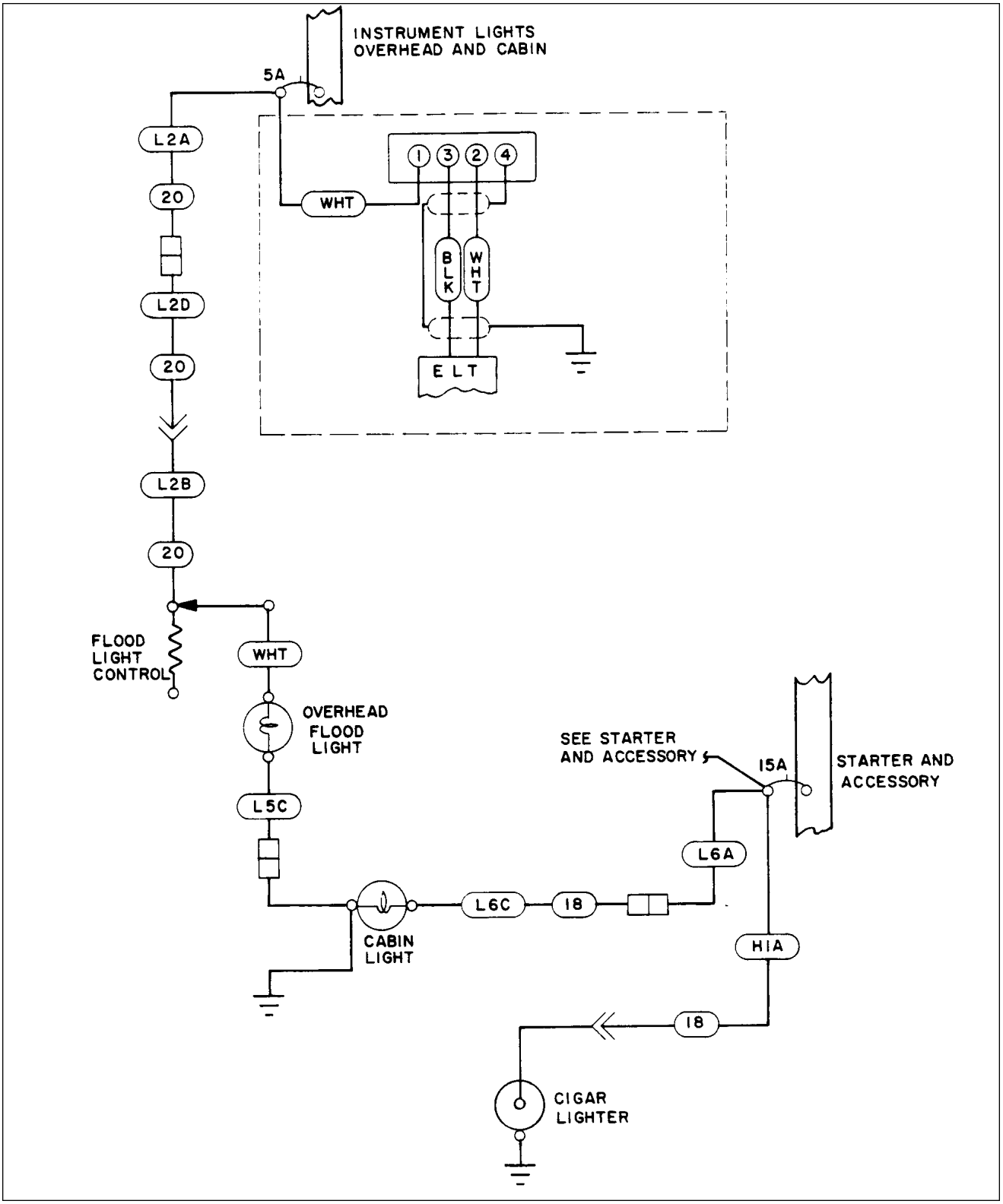


Figure 91-40. Cabin and Ovehead Flood Lighting (S/N's 28-8190001 thru 28-8690056 and 2890001 thru 2890205

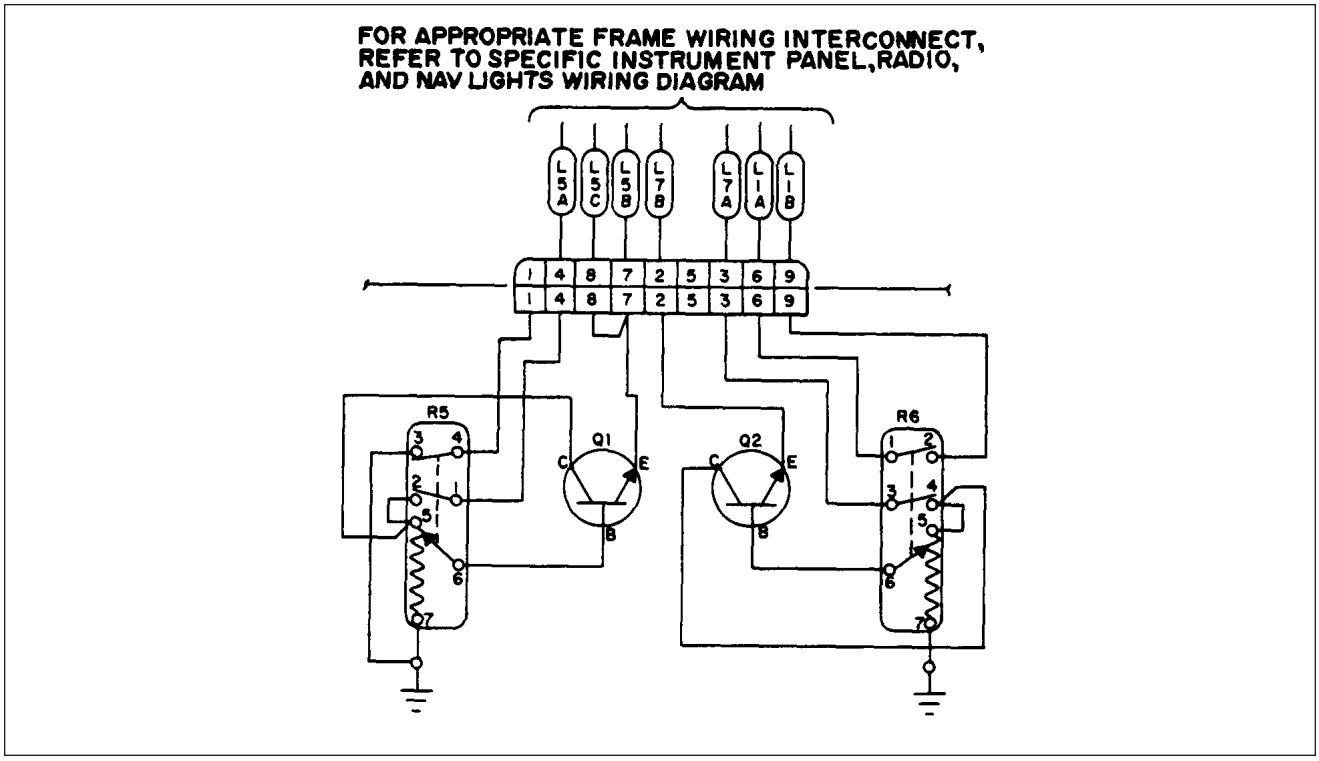


Figure 91-41. Dimmer Control Wiring (S/N's 28-8290001 thru 28-8690056 and 2890001 thru 2890205)

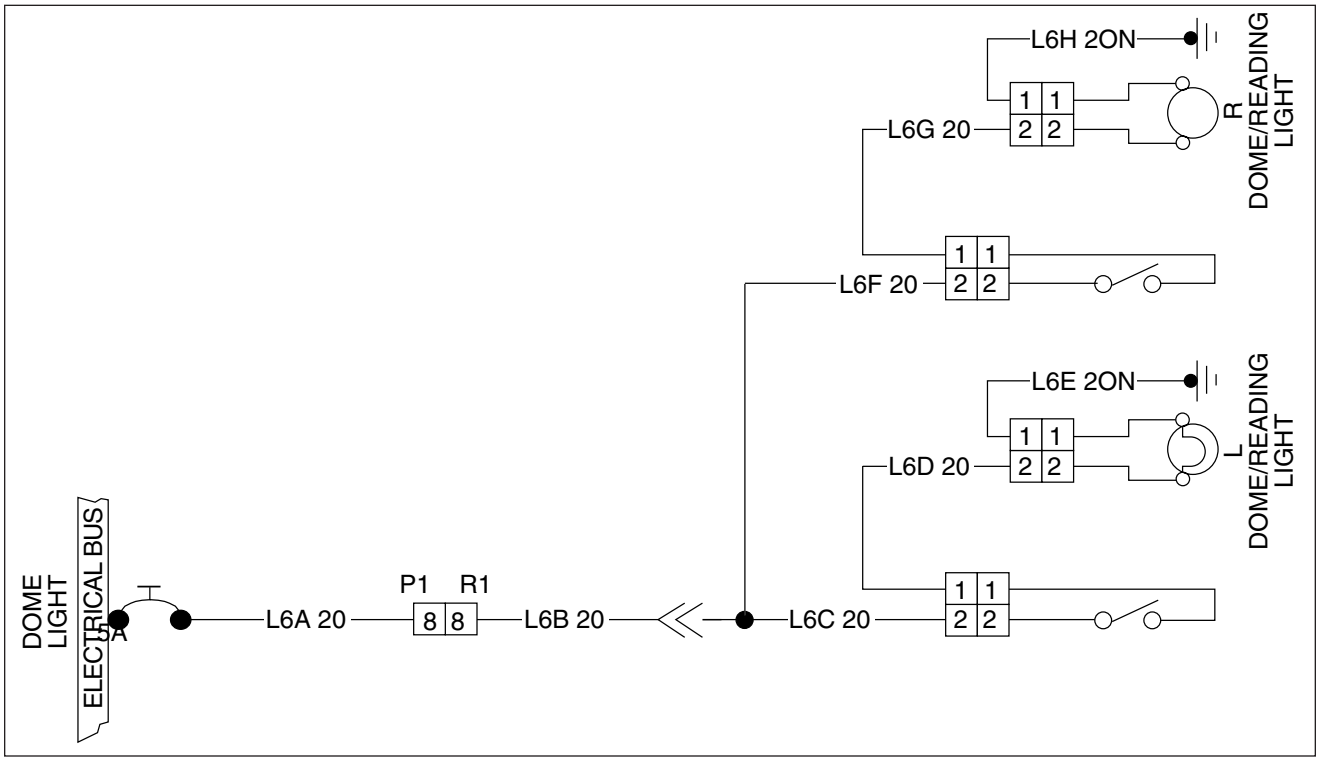


Figure 91-42. Dome Reading Lights (S/N's 28900206 and up)

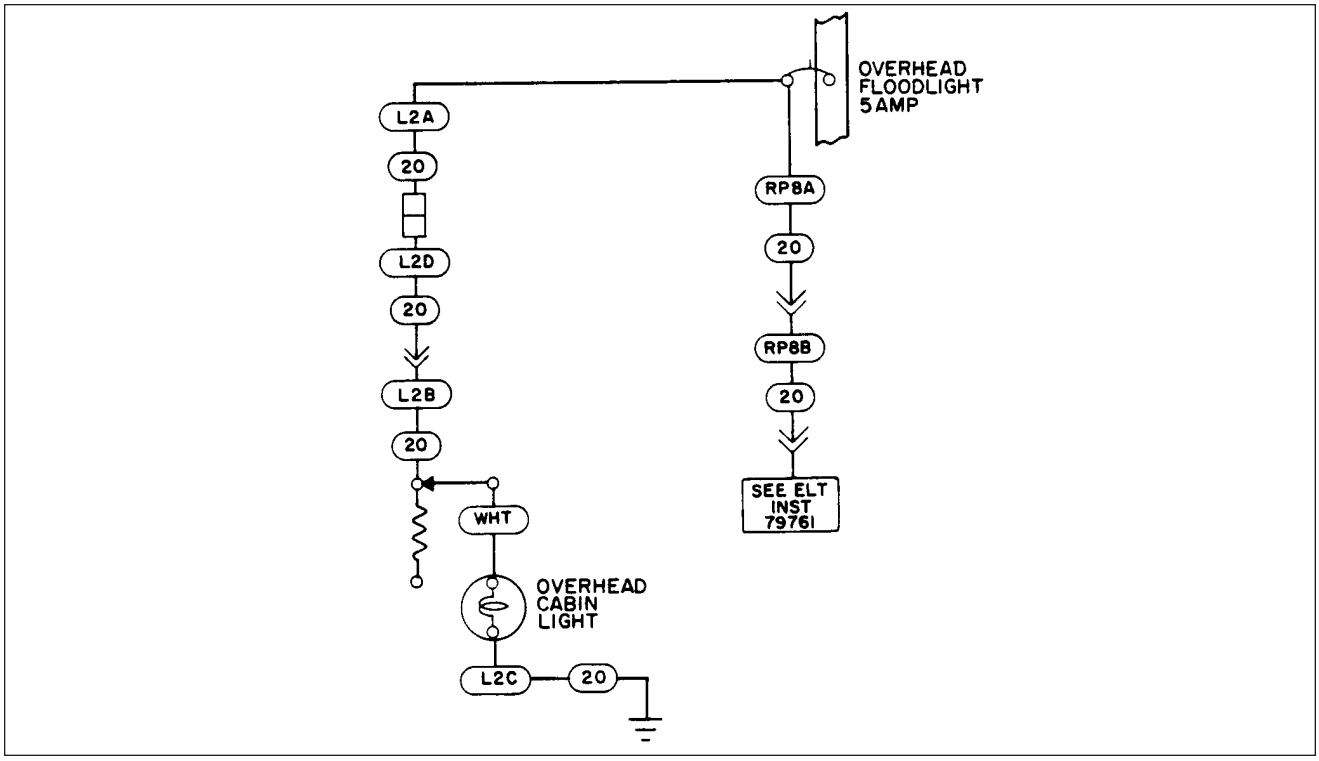


Figure 91-43. Overhead Flood and ELT (S/N's 28-7790001 thru 28-8090372)

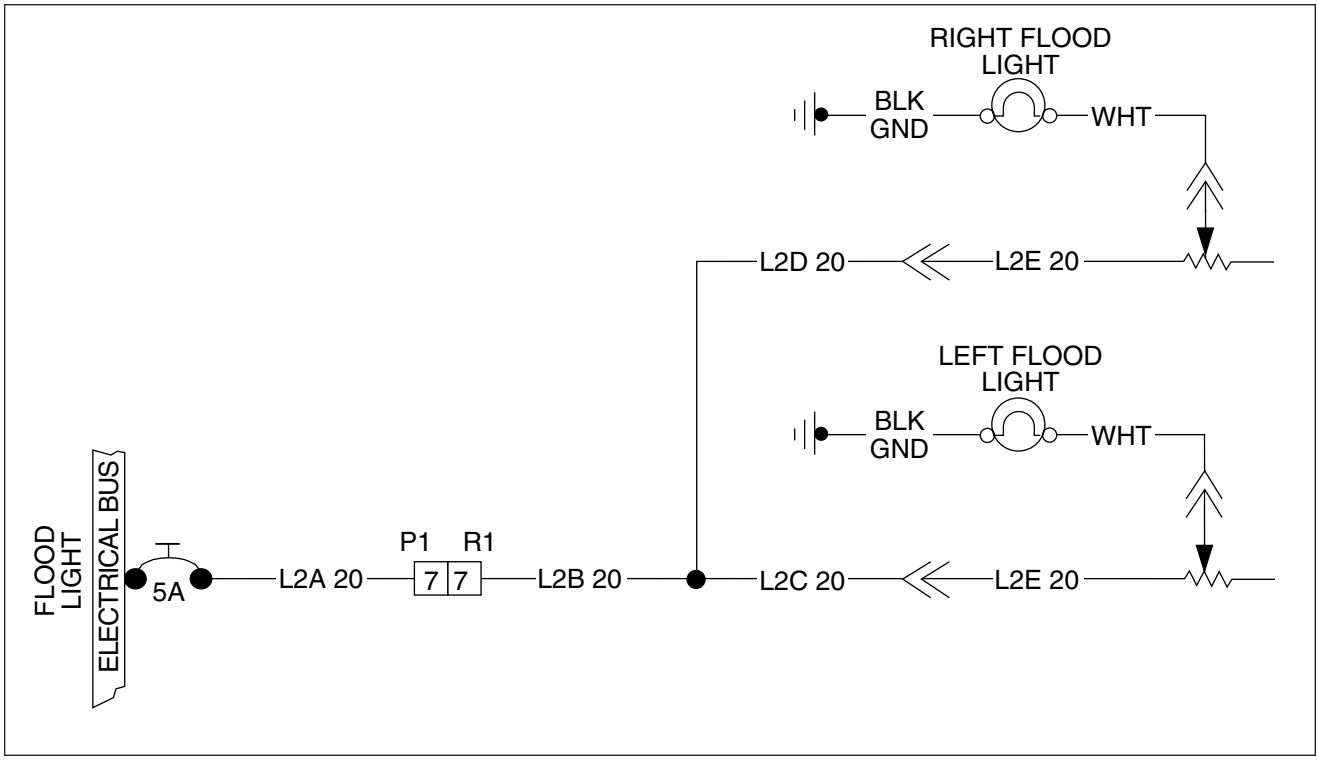


Figure 91-44. Overhead Flood Lights (S/N's 28900206 and up)

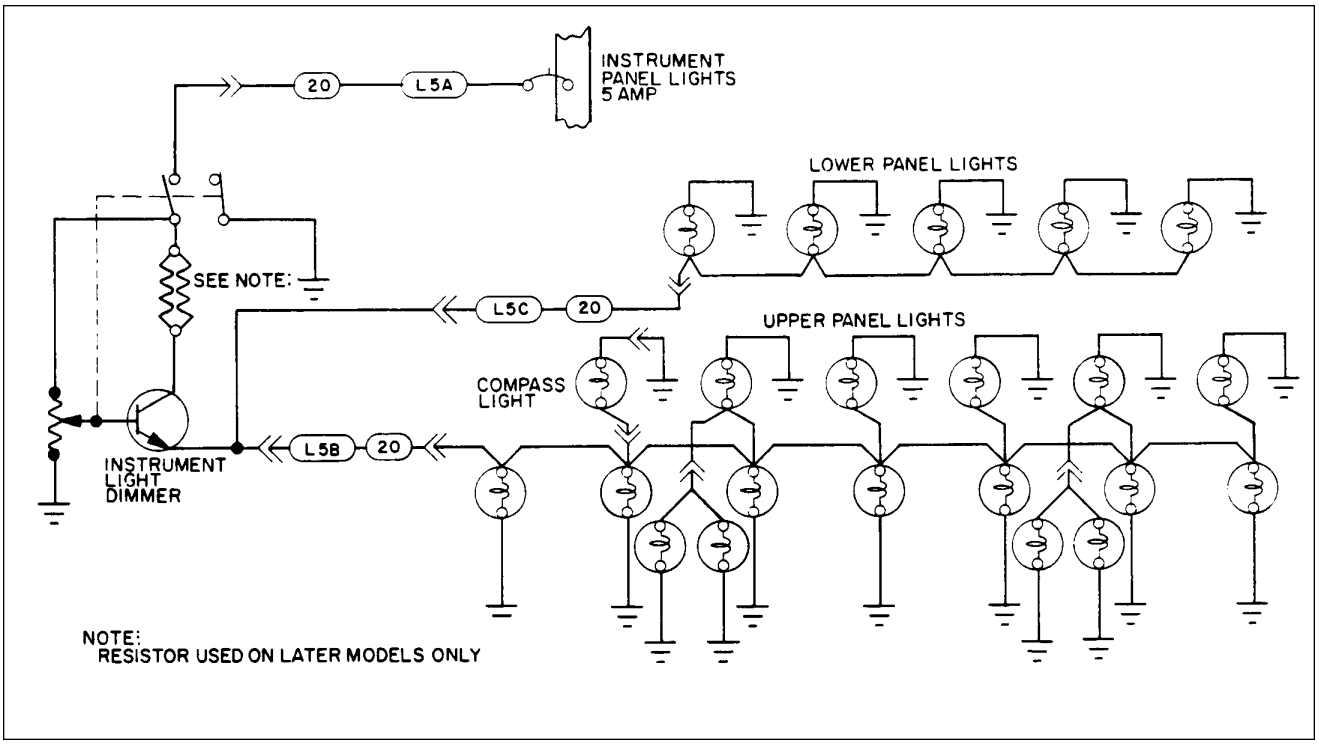


Figure 91-45. Panel and Navigation Lighting (S/N's 28-7690001 thru 28-8190318)

THIS SPACE INTENTIONALLY LEFT BLANK

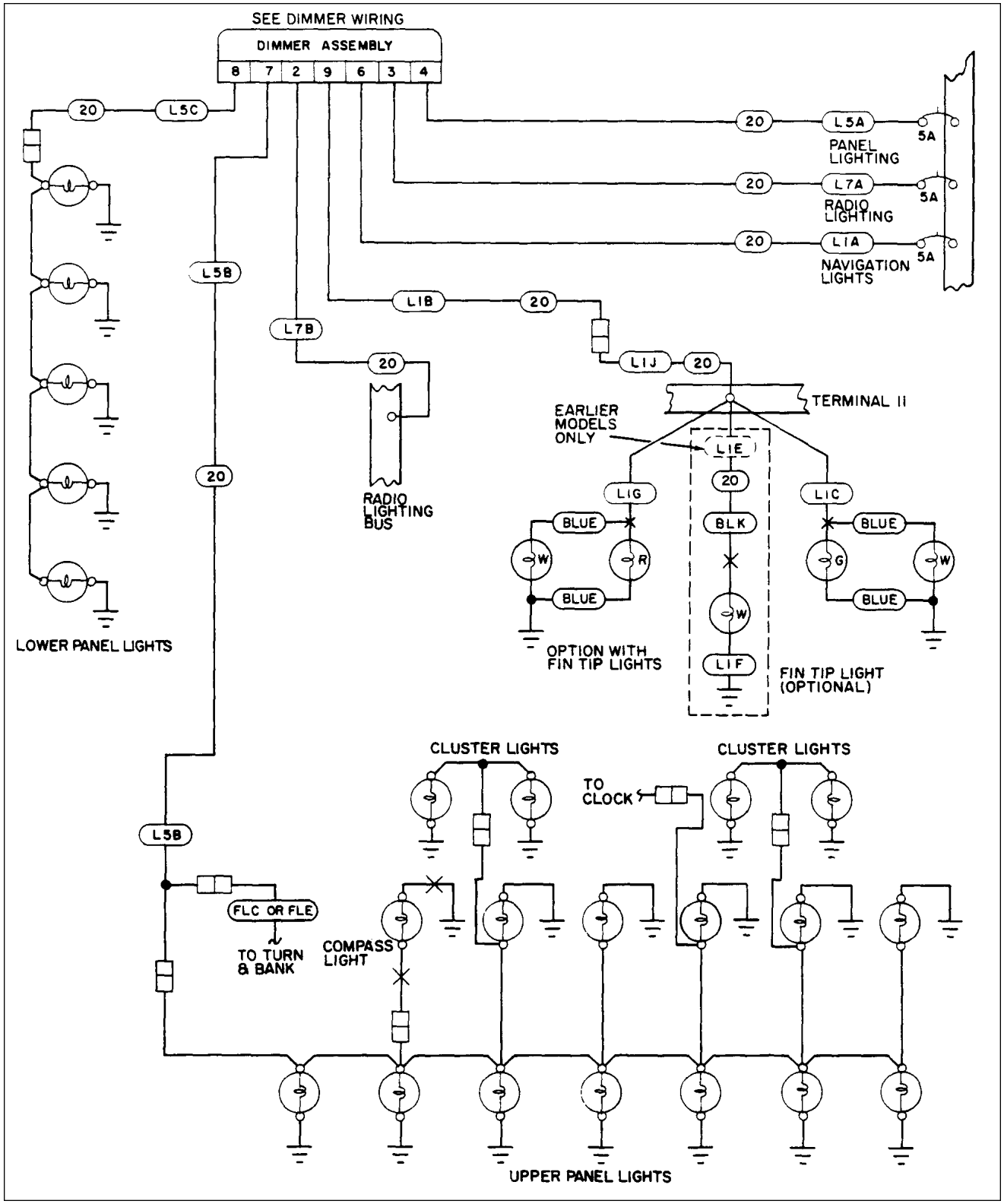


Figure 91-46. Panel and Navigation Lighting
(SN's 28-8290001 thru 28-8690056 and 2890001 thru 2890205)

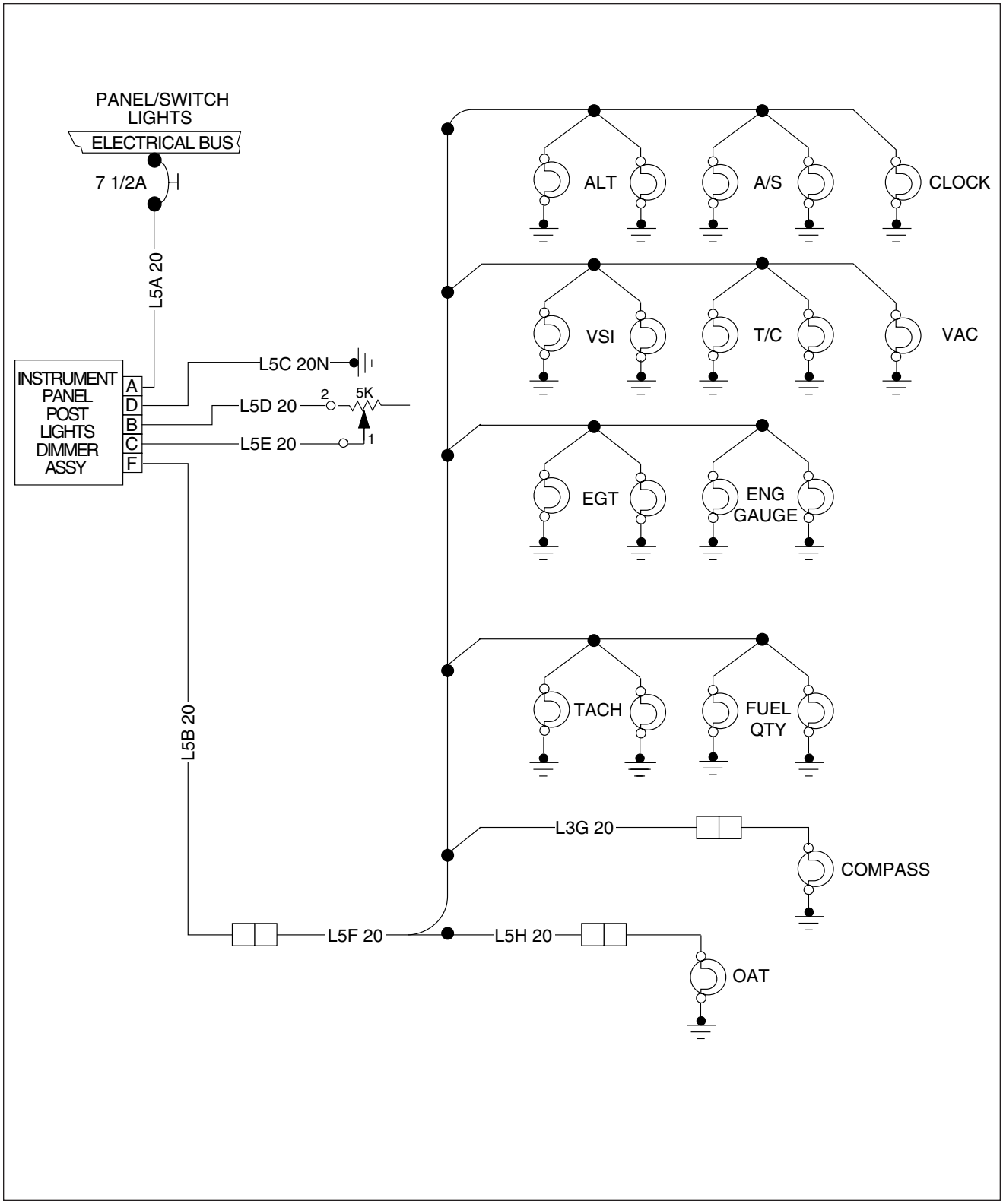


Fig 91-47. Panel Instrument Lighting (S/N's 28900206 and up)

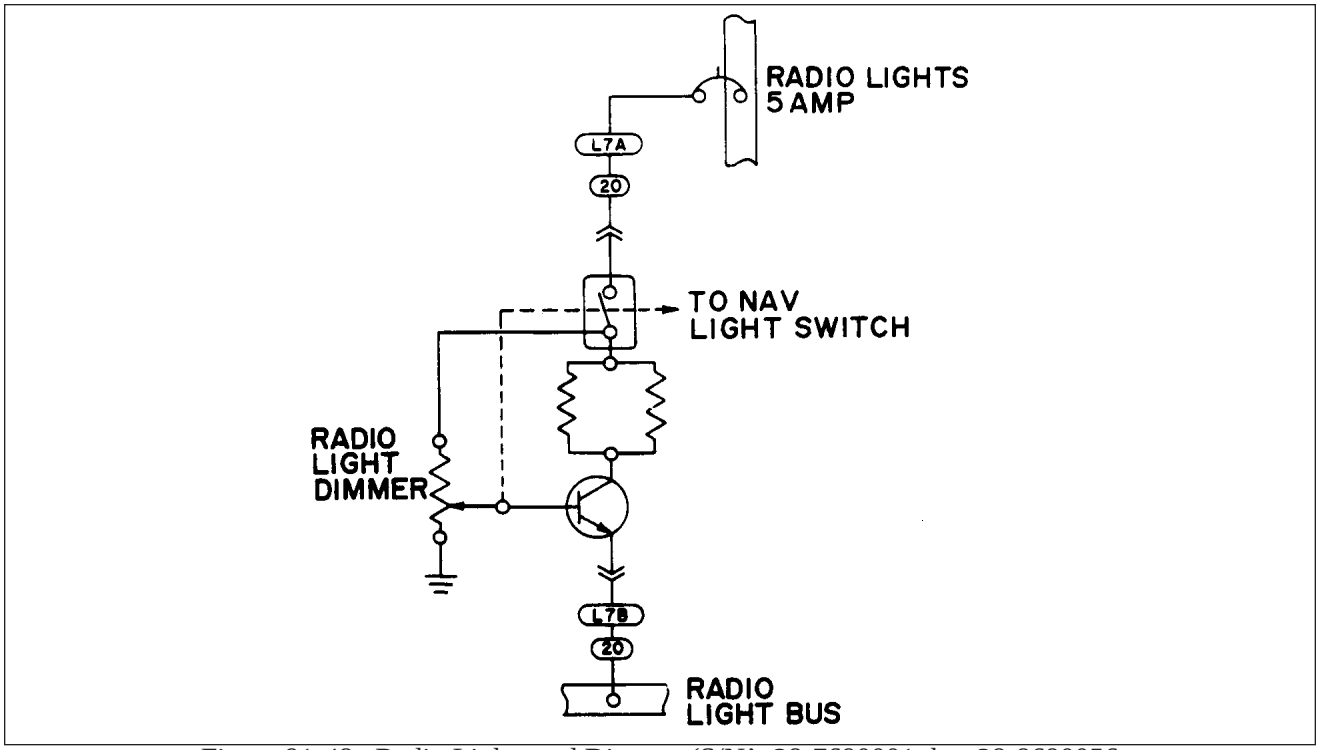
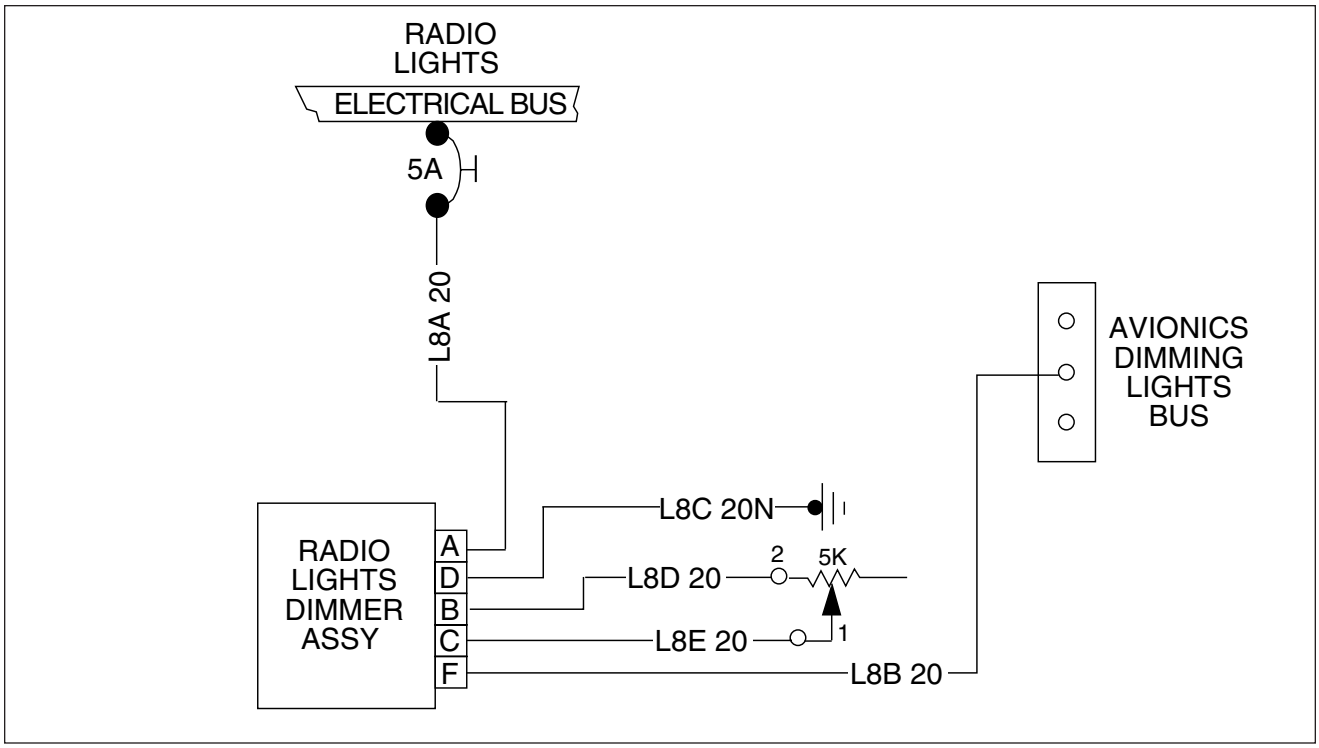


Figure 91-48. Radio Lights and Dimmer (S/N's 28-7690001 thru 28-8690056 and 2890001 thru 2890205) (Sheet 1 of 2)



Radio Lights (S/N's 28900206 and up)
(Sheet 2 of 2)

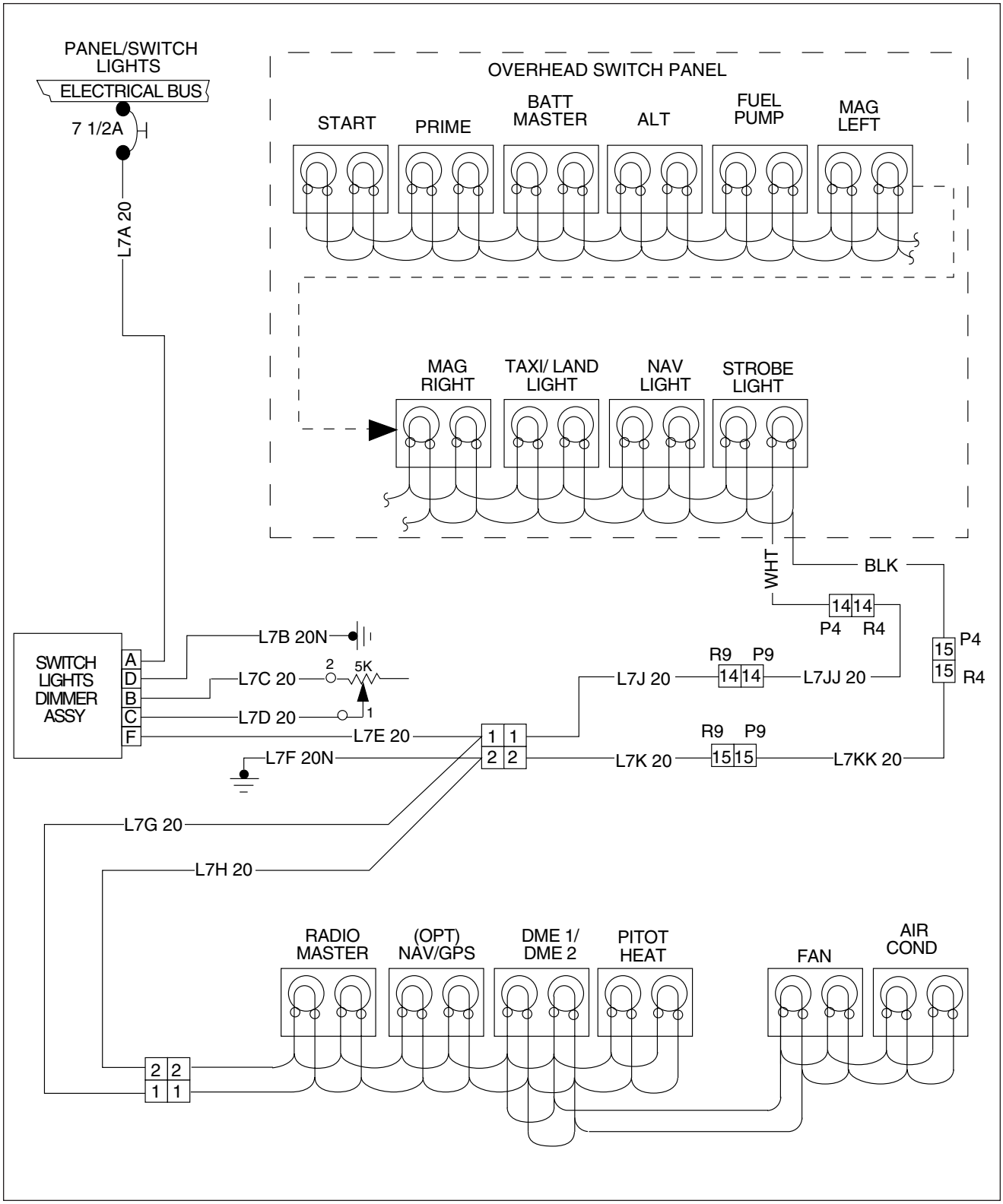


Figure 91-49. Switch Lighting (S/N's 28900206 and up)

THIS PAGE INTENTIONALLY LEFT BLANK

GRIDS 4D6 THROUGH 4L24
INTENTIONALLY LEFT BLANK